THE YEAR BOOK
of ORTHOPEDICS *and* TRAUMATIC SURGERY

(*1957 1958* YEAR BOOK *Series*)

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With a Section on

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PLASTIC SURGERY

INTRODUCTION

This Year Book of Orthopedics and Traumatic Surgery presents for the first time a separately prepared and edited section on Plastic Surgery Dr Neal Owens Professor of Clinical Surgery at Tulane University School of Medicine editor of that section is recognized throughout the world as a surgeon who is highly skilled in the technics of plastic repair of tissues I am pleased to welcome Dr Owens as an associate in the preparation of this Year Book.

Plastic surgery of the extremities including extensive skin grafting extends into the realm of orthopedic surgery Reconstructive surgery performed by orthopedic surgeons should be of interest to the surgeon who has specialized in plastic surgery We hope that by combining the abstracts of selected articles of both specialties in one volume the interest in this book will be enhanced for the physician in general practice and also for the orthopedic and plastic specialist

In reviewing the orthopedic literature of the past year I have been surprised to find a relative dearth of papers dealing with surgery for the polio patient or the patient suffering from congenital anomalies or deformities The emphasis in the orthopedic literature has swung more and more to fractures dislocations and other types of trauma to the spine and extremities It would appear that the success of the Salk vaccine has psychologically produced a lessening interest on the part of the orthopedic surgeon in the needs of the polio patient This is true despite the fact that the vaccine as yet cannot possibly have made any appreciable difference in the number of patients who need orthopedic surgery because of paralysis or deformities resulting from polio The daily newspaper stories about atomic weapons and the attempts to describe the horror of an atomic war may be the indirect cause of this greater emphasis on methods and technics for coping with orthopedic problems which result from severe traumatic injuries Every surgeon must have asked himself repeatedly what he would be able to do to help in the event of a major catastrophe with mass casual

ties as might occur if an atomic bomb were dropped on one of our large cities Each proposed plan for meeting an emergency such as this should be of interest to all physicians

Interest continues to be shown in the disabilities resulting from mild whiplash injuries of the neck and in the pain in the neck shoulder and arm syndrome Some controversy exists with regard to the presence or significance of pathologic changes in the Luschka joints of the cervical spine. It may be that the prolonged disability which so often occurs following what at first appeared to be an insignificant injury may be explained on this basis The medicolegal aspects of the whiplash injury have become so exaggerated that almost everyone who suffers a slight soreness of the neck following an accident caused when the car in which he was sitting was bumped by a following car is persuaded to sue for damages An orthopedic surgeon who recently discussed this problem stated that in his opinion the greatest deterrent to recovery of a patient who had had such an injury was the nervous tension which always attends litigation He also stated that no patient that he had treated had ever been cured until after the lawsuit for damages had been settled

Orthopedic surgeons continue to show an interest in surgery of the hand and abstracts of many excellent articles have been included in this volume Also we have again included a chapter entitled Geriatric Orthopedics

I express the hope that the changes which have been made in this YEAR BOOK will be accepted and approved by those readers who have honored us with their support in the 10 years during which I have been the editor

EDWARD L. COMPERE

ANATOMY PHYSIOLOGY AND PATHOLOGY

Arterial Supply to Head of Femur Arteriographic Study in Vivo of Lesions Attending Fracture of Femoral Neck. Herbert Mussbichler[1] (Falun Sweden) performed percutaneous puncture of the femoral artery with injection of 15 20 ml of 50% Diodone in 28 cases of affected hips including 3 of pertrochanteric fracture and 11 of medial fracture of the femoral neck The sound hip was examined in 15 of the cases Also investigated were 4 cases of necrosis of the femoral head 2 of pseudarthrosis 1 of carcinomatous metastases in the acetabulum 2 of Perthes disease, 2 of dislocation and 1 of Judet s plastic operation

In normal hips there was invariable contrast filling of the medial and lateral circumflex arteries of practically equal density irrespective of variations in origin and course There was also invariable contrast filling of the posterior collum branch its course was visualized to the intertrochanteric notch In affected hips local vascular changes were demonstrable in the posterior collum branch These changes were dilatation decreased rate of flow and arrested circulation

The arteriographic appearance of the posterior collum branch of the affected hips was considered pathologic since the changes were not noted in sound hips Dilatation of the posterior collum branch suggests hyperemia following tissue damage or vascular injury not capable of demonstration A decreased rate of flow in the artery may be due to stasis in arterial or precapillary vessels Arrested circulation even if only temporary may result from obliteration of vessels due to rupture torsion thrombosis or some other cause

Four Normal Anatomic Variations of Importance to Radiologists are described by Theodore E Keats[2] (Univ of California) The importance of these variations lies in distinguishing them roentgenologically from pathologic lesions

Not uncommonly the occipital bone may show venous

(1) Acta radiol. 46 534-546, September 1956
(2) Am J Roentgenol. 78 89-94 July 1957

lakes which may be so extensive as to suggest a pathologic state These vascular diploic spaces may be scattered throughout the bone or may be confluent and may or may not be symmetrically distributed about the midline Occipital venous lakes may vary considerably in size and configuration and are commonly seen in patients past age 50 In the author s experience the frequency of this finding absence of pertinent signs and symptoms and follow up examinations have assured the benignancy of these lesions

Occasionally the roentgen images of the calcified costal cartilages and the sternum in the lateral projection may fall into a pattern simulating a destructive lesion of the xiphoid process and adjacent portion of the body of the sternum This picture particularly presents a problem when there are symptoms referable to the sternum The misleading appearance is produced by a combination of a curved xiphoid process with convexity directed posteriorly concavity of the caudal end of the body of the sternum and heavy costal cartilage calcification seen anteriorly This variation in appearance is not unusual

At roentgen examination of the feet of young persons for fracture the author has encountered on several occasions in the oblique projection of the foot a small flakelike portion of bone apparently lying in the soft tissues of the plantar aspect of the heel with irregularity of the underlying calcaneal tuberosity This finding was originally misdiagnosed as a fracture despite the absence of symptoms in this area since a similar appearance was not demonstrated in the other foot

Other such cases have been seen again without symptoms referable to the calcaneus In each the calcaneal apophysis was still open The simulated fracture is produced by projection of the caudal tip of the apophysis into the soft tissues of the heel in the oblique view The suggestion of fracture is strengthened by the normal irregularity or slight concavity of the adjacent bone of the calcaneal tuberosity Apparently variations in prominence of this tip of the calcaneal apophysis result in the inconsistent appearance of this finding for it may be demonstrable only unilaterally in a given patient

X ray visualization of the pericardial shadow of the right

cardiac border may be striking enough to simulate calcification and has been misinterpreted as pericardial or myocardial calcification This appearance is probably the result of contrast with the adjacent radiolucency of the subepicardial fat In cases in which the pericardium has been visualized failure to reproduce this shadow consistently in several x rays or with slight changes of position will indicate the true nature of the shadow

Morphologic and Histochemical Study of Osteoclasts in normal and in *ia* animals is reported by S N Bhaskar C I Mohammed and J P Weinmann[3] (Univ of Illinois) Although appositional growth of bone is normal in the *ia* strain of rats there is minimal resorption Therefore a difference in osteoclasts of normal and *ia* animals might be expected

The three-dimensional aspects of osteoclast morphology were studied by camera lucida tracings of serial sections of osteoclasts from the region of the sockets of developing teeth The nucleic acids in the osteoclasts were studied in sections cut through the alveolar regions of normal and 5-day old *ia* rats The sections were stained by the Feulgen technic and with thionine

No differences were observed in the size and shape of the osteoclasts of normal and of *ia* animals The osteoclasts were much larger and their cytoplasmic extensions much wider than has been suspected In some areas the osteoclasts formed a syncytium and large areas of the cytoplasm were without nuclei Osteoclasts possess long processes which may or may not contain nuclei Thus in nonserial histologic sections passing through the processes of these cells the osteoclasts may be overlooked or mistaken for osteocytes or osteoblasts lying in areas of resorption The cytoplasm of normal osteoclasts stained more intensely with thionine than did the cytoplasm of the *ia* cells Perhaps protein synthesis is decreased by *ia* osteoclasts Nucleoli were present and apparently similar in the nuclei of both normal and *ia* osteoclasts.

This study indicates that osteoclasts do not originate from liberated osteocytes as has been thought and that they are not due to bone resorption

(3) J Bone & Joint Surg. 38-A:1335 1345 December 1956.

Longitudinal Bone Growth Nutrition of Epiphysial Cartilages and Local Blood Supply Experimental Study in Rabbit. Harald Brodin[4] (Univ of Lund) studied the effect of periosteal loosening on longitudinal bone growth nutrition of the epiphysial cartilages and local blood supply in *the regions of the epiphysial cartilages of the rabbit tibia* Loosening of the periosteum of the proximal half of the tibia was followed by increased growth in length from the distal epiphysial cartilage and decreased growth from the proximal cartilage These changes in growth rate persisted throughout the study period of 160 days

Intravenously injected fluorescent substances (water insoluble benzpyrene and water soluble sodium 3-oxypyrene-5 8 10-trisulfonate) entered the epiphysial cartilage mainly via the bone marrow and to a much greater extent from the metaphysial than from the epiphysial side

Measurement of the temperature in the marrow cavity of the tibia clearance of isotopes from the cavity and colorimetric determination of the amount of intravenously injected sodium chromate taken up by the tibia proved value less in the investigation of any correlation between disturbances of the local circulation and changed growth in length of the bone

The first few days after operation the temperature of the skin over the area operated on was higher than that over a corresponding area of the control leg but 1 week after the operation it was lower After that it gradually increased to reach that of the control side in a few weeks

The radioactivity measured over corresponding parts of both legs after intravenous injection of erythrocytes tagged with radioactive chromate indicated that the amount of blood in the operative field was greater than that in a corresponding region of the control leg for up to 2½ weeks after operation

Photometric determination of the fluorescence of frozen exposed marrow cavity of the tibia of rabbits that had received an intravenous injection of sodium 3-oxypyrene 5,8 10-trisulfonate suggested a certain correlation between the rate of growth in length of the bone and the local blood supply 6 weeks after operation Distally the flow of blood

(4) Acta orthop. scandina supp 20 1955

and the rate of growth were increased from the day after operation

Reflections on Bone Grafts based on animal experiments and clinical observations are presented by P Lacroix R Ponlot and L M Leas (Univ of Louvain) From studies of bone and cartilage transplanted to three extraskeletal sites—anterior chamber synovial membrane and underneath the renal capsule (principally the last)—they derived the following (1) cells contained in certain skeletal tissues may have their functional potentialities modified by experimental conditions imposed by the grafts (2) connective tissue cells which normally do not participate in osteogenesis can in grafts be led to exercise this function (3) acquisition of this new function may be observed under the influence of living skeletal cells and of an unknown factor (independent of life) inherent in the constitution of skeletal tissue

An occasional fact from previous investigations may seem to weaken these propositions but none contradicts them formally and directly Comparisons are difficult because most earlier investigations consisted of experiments simulating clinical operations The authors consider this the poorest type of experimentation because it does not distinguish between that which occurs in the graft and that due to the transplantation site Extraskeletal sites should therefore be used in investigations on osseous grafts Radioactive isotopes and microradiography will become indispensable in penetrating the subject of bone grafts Tissue culture studies can throw light on grafting problems but are incapable of solving them alone A change of orientation toward immunology could give great impetus to experimental researches on osseous homografts and heterografts as has happened in the case of cutaneous grafts

Artificial bone tissue can be produced under the influence of nonskeletal tissues The classic example is the graft of vesical mucosa which in certain sites regularly stimulates osteogenesis in surrounding tissue The relation between this phenomenon and those associated with the presence of skeletal tissues cannot always be definitely distinguished

Clinical knowledge of bone grafting is empiric and

(5) Recipe 16 73-84 195

methods are replete with unknown factors No doubt the same words will be used to describe radiologic evolution of a graft but the orthopedic surgeon should at least be aware that *present concepts could be enlarged* Orthopedic surgery, however has provided its own biologic teachings The most striking is progressive adaptation of certain grafts to their function as supports e g late result of an extra articular arthrodesis of the hip The graft not only obeys intrinsic factors but is subjected to external influences which model it, hasten its repair and favor its development

With regard to homoplastic and heteroplastic grafts of bone the clinic has taught more than the laboratory an immediate homograft behaves like an autograft The bone bank has proved that a homogenous bone graft preserved in cold storage remains efficacious for a long time. A refrigerated bone graft does not stimulate foreign body reactions in an organism of another species

Use of bone grafts in surgery has a history almost entirely clinical commencing in 1880 when William Macewen of Glasgow replaced a portion of destroyed humerus giving a useful arm to a boy 5 Since then progress has been constant but almost entirely uninfluenced by experimental research

Incidence of Osteochondrotic Changes in Cervical Spine of 400 Symptom Free Adults as Seen by X rays H J Tepe[6] (Univ of Hamburg) took lateral x rays of the cervical spine of 203 men and 197 women aged 30-80 with no symptoms referable to the cervical spine. The lateral view has been found the most suitable for demonstration of the inter vertebral foramens which play an important role in development of the shoulder hand syndrome

Osteochondrotic changes increasing with age were found in two thirds of the patients Pathologic changes were commonest *between the 5th and 6th cervical vertebrae followed* in frequency by the segment between the 6th and 7th vertebrae When postural anomalies were included only 17% of the patients appeared to be normal

Normally the cervical spine shows moderate lordosis Hyperextension of the cervical spine has been thought to be an early symptom of degenerative changes However the

(6) Fortsch Geb R ı strahlen 85 659-663 December 1956.

high incidence of hyperextension of the cervical spine in this series and probably in other series as well, was due to the fact that many persons when positioned for cervical x rays, hyperextend the spine due to lack of relaxation Quite often when these persons move the neck freely and relax they reveal under fluoroscopic observation physiologic lordosis of the cervical spine The high incidence of osteochondrotic and postural changes in the cervical spine between age 30 and 80 suggests that clinical and x ray criteria of the normal cervical spine in these age groups be lowered somewhat

Comparative Metabolism of SR^{89} and CA^{45} by Bone Grown in Vitro was studied by F W Lengemann[7] (Univ of Tennessee) The comparative metabolism of calcium and strontium has been of recent interest because of the possible hazards arising from ingestion of radioactive strontium Calcium is preferentially absorbed from the digestive tract, and strontium is excreted to a greater extent than calcium by the kidney the net result of both processes favors the retention of calcium over strontium Evidence is lacking however that bone metabolism distinguishes between these two alkaline earth metals The large discriminations of the intestinal tract and the kidney could mask any selective capacity of bone when the intact animal is used as the experimental subject. Therefore embryonic chick bones were cultured in vitro to study the comparative metabolism of Sr^{89} and Ca^{45} by bone uninfluenced by the action of the other organs

The results showed that at 2 hours bone contained 1 08 times as much Sr^{89} as Ca^{45} When exposed to constant levels of Sr^{89} and Ca^{45} the observed ratio (bone medium) equilibrated at 0.83 within 7 days The Sr^{89} was released from bone at a ratio of about 1.2 times that of Ca^{45} Addition of carrier strontium markedly inhibited the long term deposition of calcium in bone, but the discriminatory mechanisms were unaltered.

Like the kidney and the digestive tract, bone forming its solid phase exhibited an over all discrimination against strontium in favor of calcium The system used for these experiments was artificial and therefore the results may not

(7) Proc. Soc. Exper Biol. & Med. 94 64 66, January 1957

quantitatively represent what occurs in vivo But it need not be assumed that embryonic and postnatal bone differ in the processes of bone crystal formation Thus the qualitative events depicted can be expected to occur in bone metabolism in vivo

Effect of Continuous Administration of Cortisone and Its Withdrawal on Bone was studied by Elsdon Storey[8] (Univ of Melbourne)

METHOD—Eight rabbits 8-12 weeks old, were given injections of 25 mg cortisone daily and histologic sections of bone were obtained at 7, 11 14 and 21 days after beginning injections Withdrawal of cortisone was studied by discontinuing the hormone after 7 days and allowing another 7 days to pass before killing the animals. Also 4 rabbits were given injections of 10 I U of ACTH daily and killed at 7 11 14 and 21 days after the first injection.

Administration of cortisone in the rabbit results in immediate resorption of bone and inhibition of new bone growth so that within 21 days all bones and bone trabeculae are thinner than normal In early stages (within 7 days) the bone is replaced by extremely vascular connective tissue and osteoclasts appear at the edges of the resorbing bone Bone resorption around dilated vessels is not necessarily associated with multinucleated osteoclasts However later in *the process vascularity decreases and marrow cells and fat* replace the resorbing bone

The epiphysial cartilage also is resorbed partially under the influence of cortisone and no new bone growth is observed With ACTH there is only a slowing in cartilaginous proliferation and osteogenesis ACTH does not have the same effect on bone as does cortisone i e neither skull vertebrae nor femur show evidence of increased resorption

After cortisone withdrawal new bone forms where previously it was being removed On the periosteal surface of the skull a layer of new bone forms separated from the old by a thick line indicating the change from inhibition of growth or resorption to the formation of new bone These lines can be demonstrated easily around the vessels in haversian systems thus showing where resorption had occurred previously New bone formation after cortisone withdrawal is greater in amount than would have been expected in a simple replacement of resorbed bone

(8) Australian & New Zealand J Surg 27 19 30 August 1957

Density as Index of Effects of Estrogens on Bone was studied by Richard A Edgren and David W Calhoun[9] (Chicago) in mice

METHODS.—*Experiment 1*—Preliminary studies indicated that diethylstilbestrol at various dose levels caused a significant increase in bone density when administered for about 3 weeks To ascertain the most satisfactory duration of treatment, male white mice were divided into 10 groups of 10 mice each. Groups 1 and 2 were killed immediately The other odd numbered groups were treated daily with 40 μg diethylstilbestrol in 0 05 ml corn oil the even numbered groups received similar quantities of oil Animals of one diethylstilbestrol treated and one control group were killed each week for the next 4 weeks

Experiment 2—As the results of Experiment 1 suggested that 3 weeks of treatment produced a satisfactory differentiation between treated and control groups, this period was chosen for assay purposes For several months tests using diethylstilbestrol estrone and estradiol 17β were carried out. The 21 daily injections were contained in 0 05 ml corn oil and the animals were killed on the day after the final injection.

Estrogenic substances stimulated increases in the densities of femora of treated mice presumably by causing proliferation of medullary bone Administration of a constant daily dose of diethylstilbestrol increased density with increased time of administration Diethylstilbestrol estradiol and estrone all showed parallel log dose response lines Estrone appeared the most potent and diethylstilbestrol the least

Observations in Man on Osmotic Behavior of Body Cells After Trauma. Victor Wynn and B J Houghton[1] (St Mary's Hosp Med School) studied patients up to 5 days after the trauma of a surgical operation coronary occlusion and dissecting aortic aneurysm Serum osmolarity measured by serum total cation levels was followed daily as was the water and electrolyte balance

Characteristically serum hypotonicity shown by a low serum total cation level developed after trauma Instances in which serum osmolarity increased were also observed and sometimes there was no change When the observed change in serum total cation level from day to day was compared with the change which would have been predicted by simple osmotic theory from the water and electrolyte bal

(9) Endocrinology 59:631-636, December, 1956.
(1) Quart. J Med. 26 375-392, July 1957

ance no statistically significant difference was found These results support the views of Gamble that taking the body cells as a whole osmotic adjustments occur by redistribution of water and electrolytes according to the concentrations of the osmotically active solutes on both sides of the cell membrane.

The authors found that potassium balance plays an important part in determining serum osmolarity In the authors patients, the osmotic value of sodium and potassium was the same Serum hypotonicity after trauma is largely due to water retention the reason for which is not understood For practical purposes serum sodium levels can be used to depict the serum osmolarity since changes in serum potassium are usually small Low serum sodium levels and the reverse are common clinical findings If treatment is required the relative amount of water and electrolytes needed to correct the disorder can be derived from the osmotic considerations Depletion of intracellular potassium commonly contributes to the cause of serum hypotonicity and this should be taken into account in prescribing treatment

Callus Formation is reported by G Küntscher[2] In bone healing two stages should be distinguished (1) mesenchymal connective tissue proliferation in the fracture space and (2) transformation of this tissue into a bony bridge which will connect the fractured parts

According to Kuntscher the first stage develops through inflammation It has been known for long that the fracture presents more or less also the classic signs of inflammation i e. swelling redness heat and pain During the first stage of callus formation there is biochemically a local acidity which during the second stage with beginning calcium deposition turns alkaline. Biochemically inflammations are characteristically acid and also develop in stages Kuntscher found that callus formation follows inflammation and that without inflammation no callus develops Experimental inflammation may produce a callus even without a fracture

It was also observed that in regard to callus formation the type of inflammation does not matter The bone responds to any kind of stimulation with callus formation

(2) *Arch. orthop. u. Unfall Chir* 49 114 1957

only intensity and duration of inflammation count Thus with sufficient intensity, inflammation due to chemical mechanical infectious, toxic or thermic causes produces the same type of callus (Fig 1) *Inflammation* was induced



Fig. 1 —Heavy thickening of canine ulna due to callus. Resection of radius caused severe mechanical inflammation of ulna at same height (Martin's experiment) Ensuing callus simulated completely callus formation after chemical irritation. (Courtesy of Küntscher G.: Arch. orthop. u. Unfall-Chir 49 1 14 1957)

mechanically in the ulna of a dog by resection of a piece from the radius In another experiment a very similar callus was obtained by a slightly rusty medullary nail. The causes of inflammation act as stress in stimulating callus formation. The longer the duration and the greater the intensity of inflammation the larger the callus will be The most severe inflammations occur in purulent infections which also lead to heaviest callus formations Antibiotics by re

ducing the intensity of inflammation lead to much less callus formation

Kuntscher believes that whether a bony bridge and complete healing or a pseudoarthrosis develops depends not on a mechanical differentiation process as heretofore assumed but on the amount of rest the tissues are provided Solid ossification inevitably develops if not disturbed by mechanical stress or by the inflammation itself

Serum Proteolytic Enzyme Inhibitors in Bone Diseases Clinical Laboratory Method of Aid in Evaluating Disease Activity The essential feature of the proteolytic enzyme pattern in the blood of healthy subjects is an excess of rennin inhibitor over chymotrypsin inhibitor The usual values in adults are 8-12 units of the former and 3-5 units of the latter Children adolescents and young adults normally show an extremely high rennin inhibitor level frequently 60-90 units An occasional adult with no apparent disease or abnormality may maintain an elevated rennin inhibitor level throughout life There is no corresponding variation in chymotrypsin inhibitor concentrations the narrow range of values is normal for all ages

Since 1952 measurement of the proteolytic enzyme inhibitors has been made in about 100 orthopedic patients by Richard H Hall and Frank W Ellis[3] (VA Hosp Long Beach Calif) The cases selected were almost exclusively of chronic infectious diseases (primarily tuberculosis) suspected malignant tumors and rheumatoid arthritis

Serial determinations of proteolytic enzyme inhibitor patterns have been most valuable as a therapeutic guide in cases of osteomyelitis of the spine (especially tuberculous osteomyelitis) and of tuberculous bone and joint disease in general They have frequently helped in differentiation of benign from malignant primary bone tumors and have often been used in the follow up of patients with tumors to confirm the presence of metastases As a means of estimating the patient s resistance to the catabolism present these methods offer further information for the surgeon to use in reaching a presurgical judgment

(3) J Bone & Joint S rg 38 \ 1254 1264 December 1956.

Roentgen Findings in Patients with High Serum Calcium. Marvin L Daves David M Gould and Gunter Schultze[4] (Johns Hopkins Univ) reviewed the x ray findings in 75 patients with serum calcium levels of 11 18 mg/100 ml These findings were grouped as focal and disseminated lesions malacic lesions porosis changes characteristic of Paget s disease and absence of skeletal x ray abnormalities

Multiple osteolytic foci varying in size and dissemination and without surrounding bony reaction were of neoplastic origin Widely disseminated destructive changes were most frequent in multiple myeloma and less frequent in other malignant neoplasms such as carcinoma of the breast In a few breast cancers osteoblastic metastases were observed

Generalized decreased bone density with a coarsened fibrous effect and an indistinct fuzzy appearance of the cortices typified the x ray manifestations of the malacic group Differential x ray diagnosis of malacic bone disease should include renal and nutritional causes of rickets and hyperparathyroidism However since in each of the rachitic diseases the serum calcium level is normal or reduced the presence of a high level narrows the possibilities to hyperparathyroidism In this series the diagnosis proved to be exclusively hyperparathyroidism except for 5 cases in which a final diagnosis has not been established

Generalized decreased bone density with a thin sharply defined trabecular pattern giving a pencilling effect or in fine textured bone a ground-glass appearance characterized the porotic group Only a few causes of bone porosis emerged These included thyrotoxicosis Cushing s syndrome and postmenopausal osteoporosis Four patients with hypervitaminosis D also had osteoporosis Porotic changes were frequently encountered in malignant diseases

In 22 of the 75 patients studied no skeletal x ray changes were found these included patients with sarcoidosis hyperparathyroidism thyrotoxicosis and malignant disease

Ultrasonic Energy and Surgically Produced Defects in Bone Nicholas I Ardan Jr Joseph M Janes and J F Herrick[5] (Mayo Clinic) studied the effect of ultrasonic en-

(4) Radiology 68 48-53 January 1957
(5) J Bone & Joint Surg. 39 A 394-402, April, 1957

ergy on the healing of defects created surgically in the femora of 67 dogs Ultrasonic energy was applied to anes thetized dogs with a power of 5-25 watts in various groups of animals The Siemens Sonostat generator with a fre quency of 800 kc. and a sound head with a radiating sur face of 10 sq cm were used in all cases

The rate of healing of fractures which occurred subsequent to ultrasonic exposure did not vary from that of the controls and of other dogs observed The exposed femora often exhibited more new bone formation either endosteal or as the result of fibrous metaplasia than did the controls This new bone in the exposed femora was not at the defects but at various distances from them whereas new bone in the controls was in and adjacent to the defects In the ex posed bones there was minimal or no new bone in the de fect exposed to ultrasound compared with the pronounced formation of new bone in the control defect. Although a type of osteogenesis apparently was more greatly stimulated by creation of the defect combined with ultrasound than by the defect alone, the osteogenesis resulting in the former case was purposeless and without direction with respect to repair of the defect This purposeless hyper- or metaplasia suggests a possible tendency to malignant disease.

The potentially destructive force of ultrasonic energy was again observed Necrosis of bone in the absence of demon strable x ray changes was seen This shows the danger of using x ray criteria as an indication that damage has not been produced Even slight cortical necrosis makes a bone more susceptible to fracture. Since this change had been demonstrated as long as 9 months after exposure to ultra sound this possibility should be remembered when manipu lation of a joint is considered after ultrasonic therapy

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CONGENITAL DEFORMITIES

Arthrogryposis Multiplex Congenita was studied in 7 pa tients by F W Scherer and K F Schlegel[6] The entity belongs to the group of congenital malformations and is characterized by contractures in the extremities the joints

(6) Arch. orthop. u. U fall-Chir 48 667-678 1957

of which are not affected Many mixed forms and borderline cases have been reported In most patients all four limbs are affected (Fig 2) Involvement of only the upper limbs is least common

Little is known about etiology The authors observations suggest that the symptoms are caused by congenital hypoplasia of the muscles of the limbs leading to rigidity of the extremities Additional signs are dimples on the extensor surface of the joints Intra uterine factors such as viral infections vitamin B_2 deficiency toxic agents (quinine x ray), might have an etiologic role

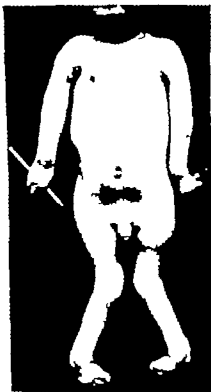


Fig 2.—Typical quadriplegic form, with extensor contractures and x-legs. (Courtesy of Scherer F W, and Schlegel, K F: Arch. orthop. u. Unfall Chir 48:667-678, 1957)

Conservative therapy e.g cast hydro- and physical therapy achieves only limited improvement in function Further improvement calls for surgical management including arthroplasty The larger joints must be handled first no surgery being done on the small joints until school age The atrophic tendons must be lengthened and the *unaffected joint capsule* split This facilitates intensive physical therapy with the hypoplastic muscles

Conservative therapy with surgical procedures is effective, especially in true arthrogryposis multiplex congenita in which neurologic changes are absent

Early Diagnosis and Treatment of Congenital Dislocation of Hip Joint. In Malmo a city of about 200 000 inhabitants since 1952 almost all newborn infants have been examined by pediatricians for among other things, Ortolani click and all new cases of hip joint luxation seem to have been discovered. Sophus von Rosen[7] (Malmo Sweden Gen I

(7) Acta orthop scandinav 26 136-155 1956.

Hosp) reports that since 1952 Ortolani clicks have be
observed in 14 joints in 8 newborn girl children

In all cases x rays revealed a dislocation upward and/

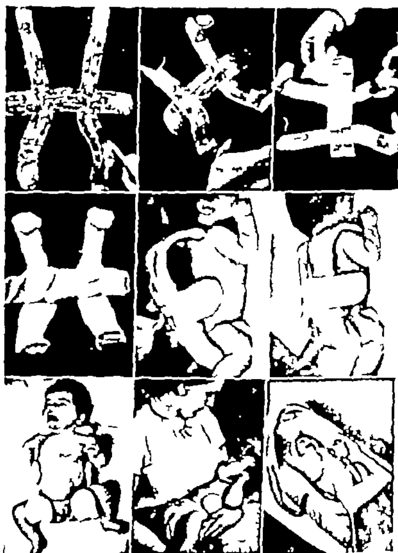


Fig 3 —Splint, cut from plate of aluminum 1 5 mm. thick, and painted w
celluloid aceton solution is easily formed after infant s body Cover can be chang
and splint cleaned without being removed. (Courtesy of von Rosen, S Acta orth
scandinav 26 136-155 1956.)

roentgenologically normal or almost normal hip joints except for 1 joint which revealed a slight subluxation The cases indicate that it is of great perhaps decisive importance that treatment be started immediately after birth An aluminum splint shown in Figure 3 has proved to be effective in 2 recent cases

Early diagnosis and early treatment presuppose co-operation between pediatricians in the maternity department radiologists and orthopedic surgeons Achieving this is a problem of organization Treatment should be guided and supervised by the orthopedic surgeon as he is best qualified for judging the development of the condition during the course of treatment

Management of Congenital Dislocation and Dysplasia of Hip by Means of Special Splint is described by Frederic W Ilfeld[8] (Children s Hosp Los Angeles) Experience indicated that early use of a splint which allows active movement of the hips is effective in infants and in children up to age 3

APPARATUS.—The splint (Fig 4) is easily adjusted for abduction and growth, controls rotation of the hip and has no pelvic band. It consists of two metallic thigh cuffs with washable covers fastened to an adjustable bar by universal joints similar to those reported by Gibson. The cuffs are locked in place with a hexagonal wrench that the surgeon retains to prevent home adjustment. The thigh bands are connected by a right angled joint with stops to allow motion through 90 degrees thus enabling the patient to sit or lie down Shoulder straps (Fig 5) or an elastic pelvic belt sometimes are needed to hold the splint in position. The cross bar affords a handle for lifting The pelvis is free for easy perineal care. Splinting is dynamic the patient may kick, sit, crawl stagger walk or run (Fig 6)

For internal rotation an adjustable outrigger bar is attached to the cross-piece and to a metallic cuff on the shin. With the thighs fixed pressure against the leg by the outrigger bar rotates the hip internally Such a position still permits crawling and walking

Early results show the value of this type of treatment and they compare favorably with results of other treatment methods such as manipulative reduction and plaster fixation Of 12 infants under age 1 with congenital dislocation of the hip who had been treated by closed reduction and immobilization after follow up of 6.8 years 69% had good functional results 23% had limp or limitation of motion

( ) J Bone & Joint Surg 39-A:99-110 January 1957

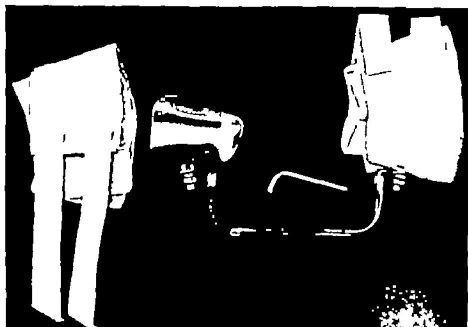






Fig 4 (top) —The splint consists of 2 thigh cuffs fastened to an adjustable bar by universal joints.
Fig. 5 (bottom left) —The splint with shoulder straps attached.
Fig. 6 (bottom right) —Patient walking with splint.
(Courtesy of Ilfeld, F W J Bone & Joint Surg 39 A 99-110 January 1957)

and 8% had pain Of these 12 47% had good to-normal results as noted by roentgenograms 38% had moderate deformity and 15% had aseptic necrosis or fragmentation of the femoral epiphysis

In splinting there is absence of fixity of traction and of months of rigidity in a plaster cast Redislocation of the hip does not occur when the splint is removed nor with exercise Hip motion within the restricted range allowed by the splint and by daily exercise permits free circulation and therefore seems physiologically desirable When there is marked adductor contracture or upward displacement of the femoral head an adductor tenotomy or preliminary traction may be indicated In this series only 1 adductor tenotomy was performed Of 4 patients treated by preliminary traction there was failure of reduction in 3 Reduction then was obtained in these 3 by splinting Abduction should not be forced in traction or splinting

In addition to the physiologic advantages of splinting this method is comfortable for the patient and convenient for the mother In dysplasia of the hip a few months of night splinting gives good results The best time for treatment is at an early age before the time of easy acetabular response has slipped by

Clinical Evaluation of Operative Procedures for Congenital Talipes Equinovarus Raymond F Kuhlmann and John Bell[9] (Univ of Vermont) reviewed 53 patients (ratio ys to girls 3 1) with 78 congenital club feet on which operations were performed. The number of bilateral and of unilateral deformities was practically the same Most operations were designed to alleviate the ill effects of tight ligamentous and tendinous structures and to eliminate the pull of active deforming elements Few operations were planned to correct skeletal deformity The soft tissue procedures were done at age 4½ (average) and bone operations at just under 10 (average)

Successful treatment of clubfoot depends on early and adequate correction followed by prevention of recurrence Conservative heel cord lengthening is effective in controlling resistant equinus deformity and muscle imbalance can often be improved by lateral transplantation of the tibialis an

(9) J Bone & Joint Surg 39-A 265-282, April, 1957

terior tendon Ligamentous and bone procedures also should be considered for anatomic and functional improvement The degree of severity of the original deformity the amount of resistance to correction of any of the clubfoot elements and the patient s age must be considered in selecting appropriate treatment In severe deformities it may be impossible to achieve a satisfactory result without surgical assistance Each procedure should be directed toward a limited goal within the over all program During the corrective period several operations may be necessary to control a deformity tending to increase with growth In this series many patients required 2-4 operations

The tendo achillis in an infant may be lengthened with minimal trauma by using a short transverse incision To retain the integrity of the sheath surrounding the heel cord the latter should be divided by a small knife blade inserted through stab wounds in the sheath To avoid further trauma and foreign body reaction no effort should be made to suture the ends of the divided tendon The natural reparative properties of the tendon will re-establish its continuity particularly if the ends are in contact within the preserved tendon sheath During infancy 4-6 weeks of immobilization in a toe to-groin plaster cast with the foot in a neutral position is adequate after which a walking cast or brace is applied to further protect the tendon until satisfactory function is restored

Heel cord lengthening with or without capsulotomy is merely one step in the program The correction must be maintained by plaster casts bivalved for night wear or an apparatus which will keep the tendo calcaneus stretched out particularly during sleeping hours Passive and active foot exercises and the wearing of proper shoes are important features of the program

Transfer of the insertion of the tibialis anterior to the 2d 3d or 4th metatarsal was valuable in controlling varus deformities The site of insertion was selected on the basis of the strength of the lateral toe extensor evertor musculature and severity of the deformity In this operation by which a strong deforming element is converted into an active correcting force all criteria for tendon transplantation must be observed The effectiveness of the pull of the

transferred tendon was shown by several patients in whom overcorrection occurred and retransfer of the tendon to its original insertion was required Overcorrection was particularly prominent when the transplantation of the tibialis anterior was accompanied by vigorous soft tissue procedures on the medial aspect of the foot The tibialis anterior should be transferred laterally no farther than the 4th metatarsal The transferred tendon can function effectively in the area



Fig. 7—Severe bilateral congenital talipes equinovarus in patient 6½ Child was subsequently treated by ligamentous release and skeletal traction. Further treatment was refused. (Courtesy of Kuhlmann, R. F., and Bell, J F J Bone & Joint Surg. 39-A 265 282 April, 1957)

of the 2d metatarsal depending on the strength of the evertor musculature and severity of the deformity

Among the procedures designed to combat persistent adduction deformity neurectomy of the medial plantar nerve to the abductor hallucis in association with lengthening or division of the origin of the abductor hallucis and the short toe flexors proved especially promising

Soft tissue procedures e.g., ligamentous release skeletal traction and combinations of both with or without associated soft tissue operations were helpful in obtaining good initial correction One to 2 years after operation however the deformity usually recurred necessitating further surgery (Fig 7) Most of the deformities treated by these methods were severe and often adaptive bone changes had already occurred

Functionally and cosmetically the best results were obtained in patients in whom tarsal arthrodesis was delayed until the bone structure of the foot was relatively mature. Derotation osteotomy of the tibia should be done only when medial tibial torsion remains as the single uncorrected element of the presenting congenital deformity It should probably not be done early because of the possibility of spontaneous correction

► [There are several types of congenital talipes equinovarus The rigidly positioned foot, without muscle imbalance as shown in Figure 7 is often a form of arthrogryposis. This is difficult to correct. Recurrences are the rule. Tibial torsion can be corrected by means of a modified Denis Browne splint. It may be necessary to have the child use the night splint for 2 or 3 years.—Ed.]

Morquio s Disease (Polyepiphysial Deforming Osteochondrodystrophy) in Two Brothers is reported by J Michail J Matsoukas S Theodorou and K. Houliaras[1] (Athens) Principal attributes of this syndrome are (1) familial occurrence (2) appearance of first symptoms at an early age (3) progressive deformity of the skeleton with resulting dwarfism and crippling (4) symmetrical localization of lesions in epiphyses of long bones and vertebrae (5) moderate musculoligamentary dystrophy (or atrophy) manifested in excessive mobility of joints in the young with progressive stiffness in adults and (6) normal intelligence Only about 75 typical cases have been reported in the literature since 1929 at which time Morquio presented his classic description of the disease in 4 of 5 brothers of a single family

Victims of this familial disease develop normally during the first year Deformities are noted first usually when the child begins to walk these progress slowly to become serious during adolescence Symmetrical deformities involve the vertebral column and the extremities sparing the head and face Bony thickening occurs in the sternum spine elbows and knees Muscles and joint ligaments are lax. Arms and legs are generally of normal length The width of the thorax is increased and its height decreased A spinal hump raises the question of spondylitis The knees show valgus deformity and flat feet are the rule Genitalia are normally developed Thoracic and abdominal organs show no specific le

(1) Helvet. paediat acta 11 403-413 October 1956

sions X-rays show thinning and deformity of bones Epiphysial nuclei of ossification develop slowly in all the long bones *All vertebrae are flattened* (one third normal height) and irregular the bony structure is loose and the cortex thinned Intervertebral disks occupy widened spaces and their height exceeds that of the vertebrae. Etiology of the disease is unknown



Fig. 8—Patient, aged 1_. Face is that of an intelligent boy the neck is short, thorax obviously deformed and genital organ well developed. Flat feet are evident. (Courtesy of Michall, J *et al* Helvet. paediat. acta 11 403-413 October 1956.)

The authors patients aged 11 and 12 (Fig 8) displayed typical features of the disease with slow progression of deformities throughout childhood Although most reports indicate that symptoms are first *noted at the toddling age or later* the parents of these children became concerned about them at about age 4 months when a kyphotic appearance was noted

Histologically lesions of this syndrome are not pathognomonic. Diagnosis is exclusively clinical and depends partly on progression of deformities which has been noted in all cases

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THE EPIPHYSES

Reaction of Epiphysis to Partial Surgical Resection was studied by Z B Friedenberg[2] (Univ of Pennsylvania) *in* 33 rabbits The cartilaginous plate of the lateral condyle of the femur was exposed on its lateral aspect and half the plate subserving this condyle was removed by curettage. The adjacent bone of the epiphysis and the metaphysis was also removed so that the *resulting defect* resembled a shallow

(2) J Bone & Joint Surg. 39 A 332 340 April, 1957

pit in the lateral condyle with the epiphysial line seen i base To prevent rapid filling of the defect by reactive t tissue bone wax was firmly packed into the resected are 17 animals The rabbits were killed at intervals betwe and 90 days after operation The femora which had beer erated on and the opposite control femur were removed dissected free of soft tissue Measurements were mad shortening and deformity After x rays were taken distal portion of the femur was sectioned in the cor plane

The operative specimens showed a valgus deformity this was not proportional to the age of the animal In mals with bone wax in the defect there was a slight t ency for less valgus to develop but no significant cor sions could be drawn The mean valgus factor of 10 ani with bone wax examined 30 days or more postoperati was 0 18 cm 13 comparable animals in which bone wax not used showed a valgus factor of 0.24 cm Femoral sh ening was greatest in animals with severe valgus

Histologic study revealed that the epiphysial plate of medial condyle was unaffected by the surgery on the lat segment and showed normal cartilage maturation and chondral osteogenesis continuing despite abnormalitie the lateral portions of the cartilage The central or ir condylar segment of cartilage showed continued nor growth sequences except in those in which the lat changes were very extensive

In animals in which curettage of the lateral condyle shown by x rays and by microscopic examination of tions reached as deep as the midpoint of the condyl more profound disturbance of growth resulted The physial cartilaginous plate in the intercondylar area thinned and cartilage maturation and bone growth was regular and retarded.

In 22 animals a study was conducted simulating the c cal condition of fusion across part of the epiphysial ca lage which is occasionally found in children following physial injuries In animals aged 6 weeks the lateral physial plate of the distal portion of the femur was expo and a rectangular segment of the perichondrium and un

lying bone crossing the epiphysial cartilage was removed and reversed after the underlying cartilage had been curetted to a depth of 2-4 mm A month later x rays were taken and the operative area exposed In 16 animals fusion was seen by x rays and a bridge of bone was observed at surgery In 10 the fusion area was widely resected and sufficient bone curetted to visualize clearly the epiphysial plate The surgical defect was then packed with bone wax. The other 6 animals which showed x ray and gross evidence of epiphysiodesis on exploration 30 days after the fusion served as controls The right and left femur were removed from each of the experimental animals 45 120 days after the second procedure. All animals showed shortening and valgus not closely related to the duration of the experiment. The shortening and deformity were related to the remaining length of the intact growing epiphysis and to the extent of the reactive bone bridging the epiphysial line as seen in histologic sections

► [Seventeen years ago, Sam Banks and I reported the remarkable ability of epiphyses to regenerate after they have been injured by trauma or disease (Ann. Surg 114 1076, 1941) An earlier paper by Banks, Krigston and Compere (J.A.M.A 114 23, Jan. 6, 1940) reported regeneration of epiphysial centers of ossification following partial destruction by pyogenic or tuberculous infections If the epiphysial cartilage plate is injured, however growth arrest with deformity and shortening of the extremity may be predicted.—Ed.]

Epiphysial Arrest for Correction of Discrepancies in Length of Lower Extremities. William T Green and Margaret Anderson[3] (Children s Med Center Boston) consider epiphysiodesis and stapling both effective procedures for correcting limb-length discrepancy provided they are used correctly With few exceptions the final clinical result in 173 patients with epiphysiodeses was good to excellent Shortening was well corrected in all but 16 of the patients in whom the operation was performed to control a rapidly increasing discrepancy rather than to correct it and in 7 in whom the procedure was done too late to effect a correction of 1 cm or over Overcorrection of as much as ½ in occurred in only 2 patients In 5 others it was necessary to perform a femoral arrest on the originally short side to prevent what appeared to be imminent overcorrecton Only 1

(3) J Bone & Joint S rg. 39-A 853-872, July 1957

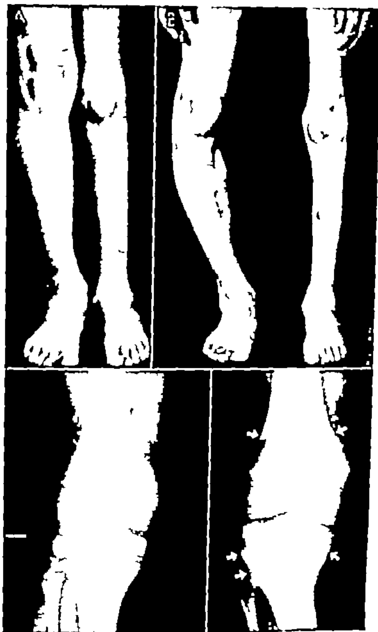


Fig. 9 (top) —Postoperative increase in varus contour of right knee: *A* preopera-tive appearance *B* 3 years later when boy was aged 16.

Fig. 10 (bottom) —X ray of right knee show preoperative state and deformity years later Continued growth of 3 cm. at distal femoral epiphysis and of 2.1 cm. lateral portion of upper tibial epiphysis are demonstrated by transverse striations laid down in bones t surgery

(Courtesy of Green, W T and Anderson, M J Bone & Joint Surg. 39-A 85-872, July 1957)

patient had a residual deformity of consequence (Figs 9 and 10), 5 had disturbing asymmetrical fusions that warranted second operations

Among 83 epiphysial staplings effective arrests without complicating factors were achieved in 55 Asymmetrical growth occurred in 2 and slow arrest (postoperative growth at stapled epiphysis of 0.8 cm or over) in 11 Complications affecting the staples only (extrusion broken staples etc) occurred in 13 and wound infection in 2 An average postoperative growth of 0 6 cm occurred at the stapled epiphysis and was observed principally during the first year after surgery

Epiphysiodesis and stapling each has its advantages and disadvantages Epiphysiodesis is a direct and definitive procedure and can be well controlled. Its weakness is that its status as a procedure of choice often depends on accuracy of prediction which on occasion may present problems Epiphysiodesis is a final thing and if prediction goes awry and overcorrection is threatened the only recourse is to fuse an epiphysis in the originally shorter limb Predictions of the effect of arrests and timing of the procedures are much more accurate if patients are followed serially for some time before surgery both as to growth and skeletal age.

Stapling has a theoretical advantage in that growth may resume after removal of the staples However growth does not occur in all instances when stapling is interrupted during the growing phase and difficulties may be met in removing staples Complications are more frequent after stapling The frequency of restapling and of secondary procedures for removal of staples are bothersome to the patient though the immediate postoperative course after stapling is somewhat less disabling and requires less hospitalization than does epiphysiodesis

Persistent Epiphyses at Elbow Joint were studied by L. Sieckel[4] (Recklinghausen Germany) in 72 persons with no history of injury Among 598 x rays of elbows made during 6 months the incidence was 3.7% Ulnar epiphyses were noted in 64 and radial in 13 patients 8 showed associated lesions such as other persistent epiphyses chondromatoses

(4) Fortschr Geb Röntgenstrahlen 85:709-716 December 1956.

osteochondritis dissecans and aseptic necroses Si[…] normalities were noted in other members of the f[…] 4 instances The persistent epiphyses were bilate[…] patients (14%) In the course of a serious generali[…] rosis of the elbow a persistent ulnar epiphysis esp[…] it is large would also be affected by the arthrotic



Fig 11—Large persistent epiphysis on left and tight air injuries more than on left. (Courtesy of Sieckel, L.: Fortschr Geb. Röntgenstrahlen 8[…] December 1956.)

(Fig 11) Isolated arthrosis of the persistent ep[…] without involvement of the joint proper was not[…] Differential diagnosis must exclude mainly fracture[…] ulnar epicondyle. Only a recent fracture can be exclu[…] x ray studies alone It has been the consensus of c[…] recently that persistent epiphyses constitute congeni[…] velopmental defects

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POLIOMYELITIS

Clinical Evaluation of Tendon Transplantation in[…] **alytic Foot** is presented by Lee Ramsay Straub J[…] Harvey Jr and Charles E. Fuerst[5] (Hosp for Specia[…] gery New York) From a study of 181 feet they foun[…]

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(5) J. Bone & Joint Surg. 39-A 1 16, January, 1957

the outcome of tendon implantation was similar whether intraosseous loop or Bunnell sutures were used The degree of tension under which a tendon was attached could not be evaluated but maximum tension seems desirable for the best result Some transfers failed if they had to function against a fixed deformity of bone In only 1 instance did a transfer produce an opposite deformity In certain feet especially club feet the authors were impressed by the strength of those tendons which had been passed subcutaneously rather than beneath the inferior extensor retinaculum

Correlation of the patients ages at the time of operation with the operative results showed no great difference in the results of the operations done in the first decade compared with those done in the second Too few operations were performed in the third decade to provide figures of any value

The benefits of tendon transfer are due to the removal of a deforming factor almost as often as to the application of a positive force in a new site Stabilization of the foot by triple arthrodesis in a good weight bearing position was again shown to be of considerable importance in the outcome of the average tendon transfer The normal tibialis anterior provides a more functional transfer than other muscles about the ankle This was most noticeable in the patients with clubfoot but was also true of the few with residua of poliomyelitis Transfers to the heel for calcaneus deformity resulting from poliomyelitis have proved worth while Usually a satisfactory result requires osseous stabilization

Many instances of transfer failure were due to tendon laxity at the time of the operation or to the tendon attachment pulling out postoperatively In the operations for club foot however 10 feet had excellent results from tendon transplants when the attachment was by intraosseous suture, though this is not a particularly strong suture

Rating of the tibialis anterior tendon in patients with clubfoot dropped only 0 6% after transfer It is possible the tibialis anterior in the clubfoot is a better than normal muscle, whereas the peroneals are subnormal in function In this small series tibialis anterior function after transfer back-

ward through the interosseous membrane was better than that of the tibialis posterior when it was transferred forward

► [This is a timely article. Many orthopedic surgeons have been discouraged because their tendon transplants did not work and have discontinued and advised against their use. The authors have clearly demonstrated that if the muscle of the tendon to be transplanted is strong and the transplantation procedure is carried out correctly a good result can be anticipated. The direction of pull between the new insertion of the tendon and the origin of the muscle should be a straight line. The tendon should be fixed securely to bone and not merely sutured to the tendon of a paralyzed muscle. The importance of correcting any deformity before doing a tendon transplant cannot be overemphasized.—Ed.]

Treatment of Flexion Deformities of Knee and Hip in Poliomyelitis according to R Merle d'Aubigne and Charles Scholder Dumur[6] must take into account the muscular contracture its pathogenesis and the mechanical factors involved in walking Retraction of paralyzed muscles in poliomyelitis may be caused by immobilization in a fixed position antalgic contracture (rare) or contracture due to muscular imbalance involving paralysis of the quadriceps or gluteus maximus alone or combined Muscular sclerosis also plays a role in flexion contractures

The greater the flexion of leg segments the greater the muscular effort required to stabilize the position By increasing flexion of the legs the moment of action of forces represented by body weight on different joints is increased. Thus muscular work necessary to balance these forces is increased and bending of the body is inhibited (Fig 12) In the upright position when all segments are in balance muscular work, theoretically nil is reduced to light contractions which maintain equilibrium Hence to stand upright and walk the paralytic does not need much muscular strength A paralytic whose muscles are equally and incompletely paralyzed can walk normally if muscular strength is sufficient to maintain equilibrium The knee which cannot be extended actively by the quadriceps tends to flex at the moment of support, inevitably provoking a fall The patient then must wear a knee brace. If flexion is severe functional shortening of the leg restricts movement and necessitates walking on crutches If the lesion is bilateral the patient becomes bedridden When the patient walks with flexed

(6) Rev chir orthop 42:591-620 Oct.-Nov 1956.

knees the lateral ligaments are insufficiently taut on condylar surfaces where the radius of curvature is small thus distributing body weight poorly on the tibial plateau and

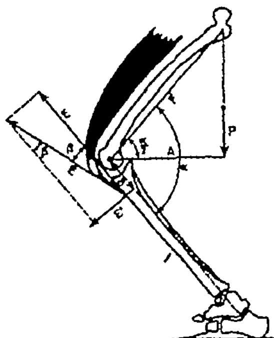


Fig 12.—Supposing skeleton of person standing with hips and knees flexed. To maintain his equilibrium, he should contract his quadriceps. P body weight E, useful force of quadriceps, A moment of action of P B moment of action of E F length of femur Equilibrium will be realized when

$$E\,B = \frac{PA}{2} \qquad A = F \cos\frac{\alpha}{2}$$

$$E = \frac{PF\cos\frac{\alpha}{2}}{2B} \qquad E = B \sin\beta$$

$$E = \frac{PF\cos\frac{\alpha}{2}}{2B\sin\beta} \qquad \text{where: } E = 0 \text{ for } \alpha = 180$$

PFB and $\sin\beta$ are constants, the force of quadriceps necessary to maintain equilibrium varying proportionally to cos of angle $\frac{\alpha}{2}$ In position of extension of lower extremities, muscular work necessary to maintain equilibrium is theoretically nil. (Courtesy of d'Aubigné R. M., and Scholder-Durnur C.: Rev chi orthop. 42.391 620, Oct. Nov., 1956.)

increasing instability This position provides ideal conditons for the appearance of early static arthrosis

Flexion of the hips greatly increases lumbar lordosis so that the patient is not forced to walk with flexed knees which is *impossible* if the quadriceps is paralyzed The patient must bend the body forward and carry weight on two canes which is fatiguing Flexion of the hips also increases

lateral instability of this joint by suppressing abductive action of the fascia lata

In patients with unilateral lesions walking is improved (1) by treating the functional shortening and (2) by stabilizing the knee which permits walking without canes and braces Surgical procedures to accomplish these ends include supracondylar osteotomy arthrodesis tendon transplantation and posterior capsulotomy This last operation has the following advantages (1) conservation of joint mobility (2) no interruption in skeletal continuity (3) short

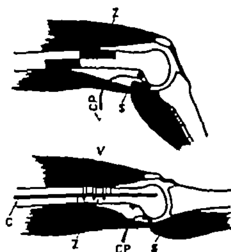


Fig. 13.—Posterior capsulotomy of knee combined, in case of severe flexion deformity with (Z) osteotomy of shortening of femoral diaphysis. Support is assured by nail and screw, risk of vascular and nerve disturbances by distention is avoided. (Courtesy of d'A bigné R. M., and Scholder Duman C. Rev chir orthop 42 591 620, Oct. Nov 1956.)

postoperative immobilization (4) good congruence of condylar and tibial surfaces (5) progressive correction of *flexion without undue distention of vessels and nerves* and (6) concomitant improvement in hip flexion when this is present Posterior capsulotomy does not present great surgical difficulties and yields excellent results (Fig 13)

Flexion of knees of 20-30 degrees can be treated by posterior capsulotomy If flexion is 30-45 degrees capsulotomy should be combined with postoperative extension If flexion is over 45 degrees capsulotomy should be combined with diaphysial shortening of the femur of 3-5 cm in bilateral cases If flexion is unilateral supracondylar oblique osteotomy should be done as a second stage after capsulotomy

Disinsertion of flexors and anterior capsulotomy of the hip permit treatment of flexion of 30 degrees which usually is adequate In combined flexion of knee and hip bilateral operation is done on the most severely affected joints If

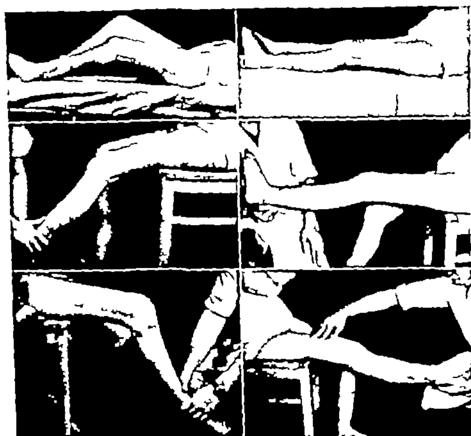


Fig. 14 (top left) —Flexion contracture of both legs before operation.
Fig. 15 (left center) —Maximum extension of left knee.
Fig. 16 (bottom left) —Maximum extension of right knee.
Fig 17 (top right) —After bilateral capsulotomy
Fig. 18 (right center) —Very good result.
Fig. 19 (bottom right) —Good result despite slight residual flexion.
(Courtesy of d'Aubigné R. M. and Scholder Dumur C.: Rev chir orthop. 42 591 620 Oct. Nov., 1956)

this correction is insufficient with regard to the second joint, residual flexion is treated by a second bilateral operation If flexion of both hip and knee joints is severe this should be corrected first on one side, with or without diaphysial shortening and later on the other side.

Of 34 patients aged 20-30 with poliomyelitic flexion contractures of the leg 20 had capsulotomies of the knee and flexor tenotomies of the hips 14 had transplantations ar

throdeses osteotomies etc The earliest operation was done 4 years after onset of paralysis and the latest after 27 years Posterior capsulotomy of the knee in 17 patients resulted in 30-60 degrees extension (average 42 degrees) When capsulotomy was combined with diaphysial shortening extension of 60-70 degrees (Figs 14-19) was obtained

Posterior capsulotomy of the knee has been generalized to include other flexion deformities of muscular origin e g in spastics and amputees with unsatisfactory extension of the stump with favorable results This operation however is not suitable for flexion deformities of arthritic origin

Experience with Poliomyelitic Scoliosis after Fusion and Correction Thomas Gucker III[7] (Warm Springs Ga) reports that of 78 patients with poliomyelitic scoliosis treated by spine fusion 9% became worse 47% showed no change and 44% were improved The average follow up was 4 1/12 years In 44 patients (56%) there appeared to be a pseudarthrosis Only 14% of these had pain however and only 18% were reoperated on About 45% of the defects were visible on x rays as long as 10 years In all patients the greatest loss of initial correction occurred at least 6 months after sitting and standing was resumed and in most it occurred after a year

The author recommends that iliac or thin tibial grafts be used in the treatment of patients with paralytic scoliosis that 4 months of recumbent immobilization be considered sufficient and that the patient wear a rigid cellulose acetate jacket for at least 2 years after the upright position is permitted

Experience in Reconstructive Surgery with Patients Having Respiratory Paralysis. According to Vernon L Nickel and Wiley L. Renshaw[8] patients with severe respiratory paralysis can be given the benefits of reconstructive surgery without greater risk than is now thought suitable During the course of 1 year 71 patients with vital capacities of 0-50% were operated on at Rancho Los Amigos Hospital Hondo Calif without a death Of 233 orthopedic patients having surgery 114 required respiratory equipment in the acute phase of the disease 26 also required tracheotomy

(7) J Bone & Joint Surg 38-A 1281 1300 December 1956.
(8) Ibid. 39 A 737 740 July 1957

In 27 patients respiratory equipment was used preoperatively 13 were transported to surgery in respiratory equipment 36 were brought from surgery in respiratory equipment 48 used this equipment after operation and 10 used the mechanical coughing device. This group emphasizes the severity of the respiratory involvement now considered not to be a contraindication for surgery

Generally speaking all patients with vital capacity of less than 30% require respiratory equipment during surgery whereas patients with vital capacity of 30-60% may or may not need the equipment depending on their breathing pattern Respiratory equipment may be useful in procedures resulting in fixed splinting from muscle spasm spinal fusion or abdominal fascial transplant even in patients with vital capacity of 60% or above As a result of the use of standard technics of intubation and manual control of respiration administration of general anesthesia is not a major problem A surprising observation in this series was that patients with lower vital capacities generally tolerated the surgical procedures better than those with higher vital capacities for whom respiratory equipment was felt not to be necessary

The advisability of using mechanical respiratory aids in operations on patients with decreased breathing function will in time come to be generally recognized just as the need for blood replacement during surgery is now recognized The respirator that originally saved the patient s life now permits this patient to be operated on

Elective Surgery on Patients with Respiratory Paralysis

Respiratory paralysis due to poliomyelitis is commonly accompanied by severe involvement of the trunk and extremities Patients so affected need complete orthopedic care, including reconstructive surgery Vernon L. Nickel Jacquelin Perry John E. Affeldt and Clarence W Dail[9] (College of Med Evangelists) state that the patient s breathing ability does not dictate his ability to tolerate surgery It merely indicates his need for mechanical respiratory assistance during the surgery

Close co-operation between the medical consultant and the surgeon is important. The patient s breathing ability

(9) J Bone & Joint Surg. 39 A 989-1001 October 1957

should be carefully evaluated on the basis of history physical examination chest x ray fluoroscopy of the diaphragm alveolar air carbon dioxide concentration and vital capacity Vital capacity can be measured by dividing the patients into general functional groups singling out those who need a particularly careful evaluation Since the test cannot indicate the automatism or endurance of the respiratory muscles it alone cannot indicate the patient s tolerance to sleep or stress or his ability to cope independently with general anesthesia and postoperative sedation

All patients with vital capacities of less than 30% should have mechanical respiratory aid during the period of medicinal sedation regardless of the type of surgery performed including those with higher vital capacities who are still partly dependent on respiratory apparatus Patients with vital capacities above 70% may be expected to tolerate all surgery independently

The many patients with vital capacities between 30 and 70% require individual evaluation In general the more dominant the diaphragm and chest muscles are in the breathing pattern the less respiratory aid is needed Thus only those with the lower vital capacities who rely on function of accessory neck and abdominal muscles will require respiratory aid for uncomplicated surgery on the distal portion of an extremity Similarly the patient with good function of the diaphragm and chest muscles may tolerate spine fusion without aid even though his vital capacity is between 55 and 65% However the authors do not feel that much latitude should be given patients in this group for they are the ones most prone to a stormy postoperative cour e particularly if the cough is not strong If doubt exists it is well to use respiratory equipment as prevention is easier than treatment of serious complications Also one bad experience may deny the patient any future consideration for surgery

A decreased morbidity in patients using respirators was noted The tank respirator is the preferred type for the postoperative patient needing temporary assistance and also after spine fusion and fascial transplants in those using other types of respirators Aside from the provision of adequate respiratory power maintenance of a continually patent airway is essential Pooling of secretions in the upper airway

is readily handled by thorough suction Turning the patient and lowering the head of the bed help to drain the most distal portion of the airway, but the best method is a good cough A coughing program is routinely prescribed post operatively and if the patient s natural cough in impaired the cof flator is used Patients in tank respirators can be coughed by the repeated rapid opening of a porthole at peak inspiration

A successful program requires a well trained nursing staff and an informed group of doctors The staffs should practice with the basic equipment until familiar with all phases of its function and on admission of the occasional respiratory patient they should review everything The main problem is the subtleness of the early signs of respiratory insufficiency

The authors do elective tracheotomy 3 weeks before the surgery General anesthesia is used almost exclusively The patient should usually awake as soon as surgery is ter minated He can then say whether or not he is getting enough air from the respirator An indication of whether he is getting enough is the degree of visible chest expan sion On being returned to the ward he is placed in the respirator and its use is continued as long as narcotics are required for pain relief His sense of comfort, general clinical appearance and vital signs are the main guides to the length of time a respirator is needed Each patient not wearing a body cast should have preoperative and early postoperative chest x rays for evidence of unsuspected atelectasis

Within 12 months 266 orthopedic operations were done 26% were on patients using respirators daily In all 48% received respiratory aid postoperatively There were no complications in the total group

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OSTEOMYELITIS AND OTHER INFECTIONS

Management of Hematogenous Pyogenic Osteomyelitis

Jacob Kulowski[1] (St Joseph Mo) points out that three patterns of the disease may be expected abortive arrestive

(1) Surgery 40 1094-1104 December 1956

and suppurative forms In abortive types the disease has not gone beyond the stage of bacterial seeding and the general and local infections have been controlled—spontaneously or by treatment The patient recovers without residual bony changes discernible on x rays This happens only in the 1st or 2d weeks of the disease The clinical episode is then closed but the patient should be checked later for possible so-called silent foci in bone (Brodie like lesions) At the other extreme death rarely ensues because of an uncontrolled bacteremia and toxemia in the 1st week of the disease (a frequent occurrence before the advent of modern chemotherapy)

The next stage in the mechanistic concept of the disease implies that bacterial fixation has occurred in the bone An arrestive and/or nonsuppurative lesion still means that the local situation and general infection are under control. Cellular defensive action has prevented frank suppuration and the resultant bony lesion is bland an infarct if it is notable on x rays as a variant of sequestrum formation

In arrestive forms aside from possible future flares complete restitution of bone may be expected so long as mechanical protection is provided (brace or cast) until this occurs Arrestive forms are an important link in the evolution of the disease from the standpoint of *diagnosis* and treatment The first involves differentiation from tumor the second demands surgical restraint so long as the lesion has become clearly localized and identified as a nonsuppurative type

Suppuration may or may not be associated with concurrent exfoliation of bone The latter cannot be predicted in the first stages of infectious localization in bone The critical point is the actual exfoliation of the sequestrum from the host bone bed When this occurs in the presence of suppuration surgical removal of the sequestrum is indicated As a rule local suppuration indicates that the general infection is apparently under control and that the disease will now continue as an independent condition

The principles of management are predicated on the assumption that hematogenous pyogenic osteomyelitis is a self limited disease and therefore amenable first to expectant or medical treatment Operative restraint is indi

cated until definite suppuration is evident clinically Along with chemotherapy every effort is made to increase the innate resistance of the patient to infection This is also true after surgical intervention The importance of tremendous dosages of the various chemotherapeutic agents is now being appreciated

Attention to the localization is focused by pain and muscle spasm Suppuration may escape diagnosis unless aspiration is resorted to when local signs and symptoms develop Sedation is always supplemented by mechanical measures aimed at the comfort of the patient, especially if joints are actually or sympathetically involved Bacterial fixation always increases the local picture of inflammation and is soon notable on x-rays (parosteal soft tissue changes occur first) This is shortly followed by patchy demineralization, periosteal reaction and breaks in the cortex (in 10-14 days) Owing to the absence of secondary infections bone changes under chemotherapy are less marked Rather than an extension of the disease absorption of an aseptic necrosis follows recalcification proceeds without extensive sclerosis and gradual restitution goes on as in the case of a bone graft Sequestra are less extensive than formerly because of the absence or minimization of secondary infection

Abscess formation clinches the diagnosis of osteomyelitis There should be no hesitancy in operative drainage when this has occurred though some surgeons recommend repeated aspirations in respect to joint infections The latter is most suitable in young children with streptococcic lesions Direct operations on the bone lesions themselves are reserved for chronic stages with obvious deep-seated infections

Infectious Spondylitis Following Peridural Anesthesia is reported by G Ziegler[2] (Heilbronn Germany) This condition may develop after paravertebral anesthesia and after surgery at the anterior surface of a vertebra. It has been assumed that through a traumatic lesion in the anterior longitudinal ligament, caused by the needle or surgical manipulation pathogenic organisms may spread under and along the ligament and start an infection

Woman, 45 had kidney stones removed under peridural anesthesia

(2) Fortschr Geb. Röntgenstrahlen 85:685-687 December 1956.

performed at the height of the 9th thoracic vertebra. Several days later pain developed in this area. X rays of the thoracic spine 3 months after surgery revealed narrowing of the space between the 8th and 9th thoracic vertebrae, slight scoliosis and a paravertebral abscess About 4 months later x rays revealed far advanced destruction of the 8th and 9th intervertebral disks and the 8th was surgically explored and removed. Bacteriologic studies were negative for tuberculosis. About 13 months after onset, x rays showed sclerosing of the bodies of the 8th to 10th thoracic vertebrae. The paravertebral part of the 9th rib had been removed at surgery At the height of 8th thoracic vertebra some kyphoscoliosis was noted.

In peridural anesthesia the injection is made into epidural space The bacteria in the author's patient apparently reached the intervertebral disks through this space

Osseous Coccidioidomycosis Chronic Form of Dissemination J W Birsner and Scott Smart[3] (Kern Gen l Hosp., Bakersfield Calif) report 18 cases of chronic osseous coccidioidomycosis with a 4-29 year follow up The patients ages of time of onset ranged from 2 weeks to 56 years and all but 1 patient returned to full activity

Roentgenograms demonstrated an osteolysis with or without cortical thickening and sclerosis The involvement was frequently in the medullary portion of the bone and is believed to be hematogenous to bone rather than by direct extension from soft tissue

CASE 1—Man 55 white had contracted coccidioidomycosis with osseous dissemination 28½ years previously while working as a welder on the railroad. Draining sinuses appeared on the forehead, left cheek, left heel both sides of the pelvis, right shoulder and right elbow Coccidioides immitis was recovered from a biopsy specimen from an abscess. Roentgenograms revealed involvement of the facial bones right wrist left calcaneus, pelvis and right scapula. The patient was treated with chaulmoogra oil for 6 weeks without benefit. About 5 years after onset of draining sinuses they were entirely healed and there was no recurrence. Multiple skin dimples marked the sites of previous drainage. Recent roentgenograms of the involved bones showed rarified cystic areas in the skull and left calcaneus, with fusion and sclerosis of the right wrist (Fig 20) These findings were unchanged since the last roentgenograms were taken 6 years previously This patient owns a store and is working full time. The only residual lesion is moderate arthritis of the right wrist.

CASE 2.—Man 31 Negro was a construction worker at onset of the disease The first symptoms were pain in the right side of the chest, cough and fever Bone involvement was noted 1 month later

(3) Am. J Roentgenol 76 1052 1060 December 1956.

(Fig 21) Duration of the disease was 4 years and 4 months. The patient now is employed full time as a construction worker

The only significant portal of entry is through the respiratory tract However 8 patients had no discernible



Fig 20 (left) —Fusion and sclerosis of right wrist 28½ years after onset.
Fig 21 (right) —Right radius at onset of disease.
(Courtesy of Birsner J W., and Smart, S. Am. J Roentgenol 76 105 1060 December 1956.)

pulmonary pathology clinically or roentgenologically at onset of osseous dissemination

The skin test is of little value in identifying osseous coccidioidomycosis All patients had positive complement fixation tests and all still have positive complement fixation tests in significant titer

No medical treatment for osseous coccidioidomycosis is known However good results frequently have been obtained when surgical excision or amputation could be performed

Hydatid Cysts in Paraspinal Muscle Compartments Their Tendency to Invade Spinal Canal *was observed by* S C Fitzpatrick[4] (Hamilton Australia) in 4 women and 2 men Hydatid cysts involving the spinal canal are uncommon They may originate primarily within soft structures outside the vertebrae or within the vertebrae (intraosseous) or spinal canal The first two types may secondarily invade the spinal canal and the last two the paraspinal soft structures All but 1 patient had a rounded swelling and pain in the back This may be regarded as a first stage in which the

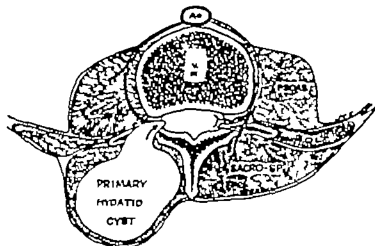


Fig 22.—Transverse section of lumbar spine showing route of invasion of spinal canal by primary hydatid cyst in paraspinal muscle compartment. (Courtesy of Fitzpatrick, S C. Australian & New Zealand J Surg. 27 31 34 August, 1957)

cyst is still confined to the muscle compartment. Four patients were successfully operated on at this stage. The next clinical stage consists of rapid onset of pain numbness and loss of power in the lower limbs indicating invasion of the spinal canal through the intervertebral foramen and onset of spinal compression myelitis (Fig 22) Two patients reached this stage 1 was surgically cured.

The paraspinal muscle compartments are formed partly by vertebrae and partly by strong fibrous sheaths only the openings through which nerves and blood vessels pass provide a means of direct spread for hydatid elements from the paraspinal muscles to the spinal canal The encysted hydatids within these compartments at first increase in size

(4) Australian & New Zealand J Surg 27 31 34 August, 1957

cranially, caudally and toward the skin and cause an ovoid swelling with its long axis parallel with the muscle fibers Further increase in size is possible only by pressure atrophy of the muscle or by extension of the cyst through the intervertebral foramens Hydatid cysts within the paraspinal muscle compartments invade the spinal canal within 12 36 months This is in sharp contrast to the primary intraosseous vertebral cyst which invades slowly

Salmonella Osteomyelitis Report of Three Cases One with Fatal Outcome and Autopsy is presented by Stanley D Simon and Caroll M Silver[5] (Providence, R. I)

CASE 1 —Man, 63 had chills fever and increased pain in the back 3 months after an injury in which he fell striking his back against a machine. X rays revealed a destructive process involving adjacent segments of the 2d and 3d lumbar vertebrae. Laboratory studies (blood and stool cultures and agglutination tests)revealed Salmonella choleraesuis infection. Temporary benefit followed administration of chloramphenicol, but symptoms recurred. Operation for drainage of a psoas abscess was performed. Cultures of the area revealed S choleraesuis. The patient died on the 10th postoperative day Autopsy revealed a ruptured sclerotic and mycotic saccular aortic aneurysm and degeneration and abscess formation of the disk between the 2d and 3d lumbar vertebrae. The aneurysm had eroded through the 3d lumbar vertebra and ruptured.

CASE 2.—Woman, 27 had severe pain in the left knee for 3 weeks X rays showed an area of decreased density in the left medial femoral condyle. At operation a window was cut in the cortex and an abscess cavity measuring 1 X 2 in. was revealed. Salmonella oranienburg was identified by culture of the pus. Stool culture was negative. Oxytetracycline was prescribed postoperatively Drainage from the operative wound ceased 4 months after surgery and 1 year later the patient was still well

CASE 3 —Boy, aged 12 months, had fever and pain in the right hip Blood culture revealed S typhosa, but stools were negative. X rays of the pelvis and hips were negative, but 2 months later a fairly large area of decreased density was found in the upper portion of the right femur A plaster spica was applied. X rays showed partial healing 2 months later and sclerosis, indicating advanced healing *6 months* later

In Case 1 injury to the spine probably caused a local lowering of resistance with onset of hematogenous osteomyelitis abscess formation and finally erosion of the wall of the abdominal aorta due to pressure of the abscess In reported cases of salmonella osteomyelitis the commonest

(5) J Internat. Coll. Surgeons 28 197 205 August, 1957

sites of involvement were the proximal end of the humerus and the distal end of the femur and of the tibia

Salmonella Osteomyelitis in Patients with Sickle Cell Anemia Hematogenous osteomyelitis is usually caused by staphylococci or streptococci but rarely by salmonellae E W Hook C G Campbell H S Weens and G R. Cooper[6] encountered 3 cases of salmonella osteomyelitis and 1 of salmonella bacteremia among 36 consecutive patients with sickle cell anemia

The recognition of pyogenic osteomyelitis in patients with sickle cell anemia may be difficult because fever pain and swelling in the extremities and leukocytosis occur in both diseases Osteomyelitis was first recognized in several of the cases reported in the literature when a subperiosteal abscess drained spontaneously X ray differentiation of osteomyelitis and bone infarction may also be difficult or impossible, particularly in small children in whom soft tissue swelling periosteal reaction and cortical destruction may be observed in both conditions Further the x ray findings do not differ significantly from the many variations found in staphylococcic or streptococcic bone infections If indicated aspiration of the involved bone should be performed

The most effective treatment of salmonella osteomyelitis appears to be chloramphenicol plus surgical drainage but usually the therapeutic response is not dramatic. Chloramphenicol is not bactericidal and drug sensitive organisms can persist in the tissues for months even with prolonged therapy as in 1 of the authors patients Activation of organisms persisting in the tissues may cause recurrence of osteomyelitis months or years after apparent healing of a previous infection as in another of the authors cases

Several factors may be responsible for the increased occurrence of salmonella osteomyelitis in patients with sickle cell anemia. Capillary thromboses may make the gastrointestinal tract less capable of resisting invasion by intestinal organisms Debility and the frequent autosplenectomy in patients with sickle cell anemia may decrease resistance to infection and predispose to invasion by salmonella organisms Once salmonellae gain access to the blood they

(6) New England J Med. 257 403-407 Aug 29 1957

may localize in areas of ischemia and necrosis resulting from the sickling process Ischemia of bone marrow may also lower local resistance and permit growth of dormant organisms thus explaining the observation that sickle cell crisis often precedes symptoms of osteomyelitis

Osteomyelitis of Pubic Junction Following Pelvic Surgery Hampar Kelikian Girir Balikian Louis Paradies and

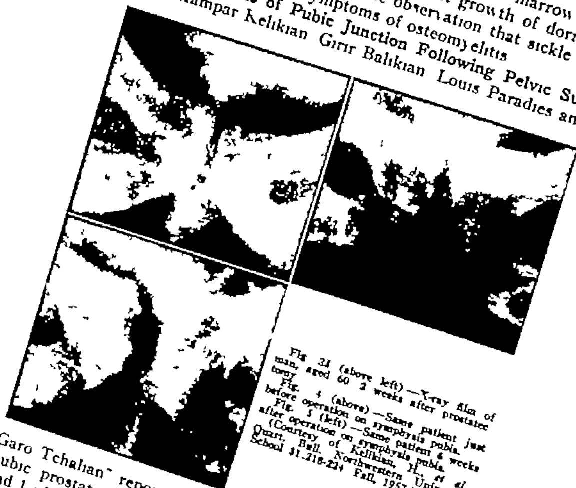


Fig 23 (above left) —X-ray film of man, aged 60 2 weeks after prostatectomy

Fig. 24 (above) —Same patient just before operation on symphysis pubis.

Fig. 25 (left) —Same patient 6 weeks after operation on symphysis pubis.

(Courtesy of Kelikian, H., et al Quart. Bull. Northwestern Univ M. School 31.218-224 Fall, 1957)

Garo Tchalian* report 4 cases Two occurred after suprapubic prostatectomy (Figs 23-25) 1 after hysterectomy and 1 after the Marshall Marchetti procedure for stress incontinence in women In all 4 positive evidence of bacterial infection was noted The seat of the infection was located to one side of the articular plate in subchondral cancellous spaces of the descending rami of the pubis or at the junction with the ischial portion of the innominate bone In all the opposite pubic plate was involved It is common practice

(*) Quart Bull Northwestern Univ M. School 31.218-224 Fall, 1957

to treat such conditions that follow pelvic or prosthetic surgery with casts and corsets with x ray therapy and recently with steroids However when the condition persists more than a month and apparently is not improving by conservative measures it should be attacked surgically

TECHNIC.—Just before surgery the patient is catheterized and the catheter is left in situ. A transverse incision about 5-6 in long is made just above the pubis (Fig 26) The inner borders of the two recti abdominalis muscles are followed and their insertion into the pubic bone is stripped partially Subperiosteal dissection is carried out in front and behind the symphysis pubis until the bony pubic arch

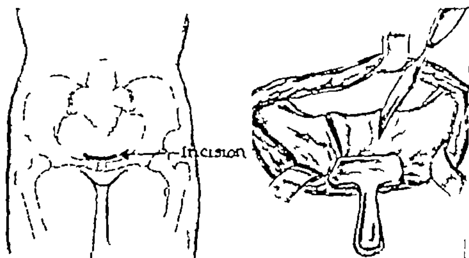


Fig 26 (left) —Incision made above pubis.
Fig 27 (right) —Exposure and line of resection.
(Courtesy of Kelikian, H et al. Quart. Bull. Northwestern U Iv M School 31 218-224 Fall, 1957)

is cleared about an inch from the midline both to the right and to the left. A wedge, with its apex pointing down is resected from the symphysial junction (Fig 27) leaving enough bone to b the obturator foramen on either side cavities are n e other bones they are curetted a s inserted de wound. The skin edges and only proximated spaced interrupted wire suture ive treatm of administration of appropriate ascertain tivity tests and removal of the ca drain wh no longer needed usually after a In case back st crolumbar belt

I Foot are di amilto (Lo ted blister i infecti foot mperature i the c

(8) rgeons 27:475-4

the blister appear doubtfully purulent the blister can be aspirated after the whole foot has been cleansed If the fluid is opalescent penicillin is given and the fluid examined for bacteria A purulent blister should be incised

Paronychia is also common It is often a complication of an ingrowing toenail The clinical features and treatment do not differ from those of a paronychia of a finger or thumb except that when an ingrowing toenail is present the corner of the nail that projects into the tissues must be removed

The small bursa that forms between a corn and the projection of bone that causes the corn usually becomes infected as a result of improper chiropody After washings of the foot the corn is pared until pus exudes Infection of the bursa over a hallux valgus usually occurs through the skin Frequently the overdistended bursa ruptures to form a sinus secondary infection then takes place The bursa and its underlying cause e.g a hallux valgus should not be removed until several months after all signs of inflammation have disappeared

Suppurative tenosynovitis of a toe is rare Its physical signs are comparable to those of infection of a tendon sheath of a finger that does not communicate with the ulnar bursa When the symptoms and signs persist despite 24 hours rest, elevation and antibiotic therapy the flexor tendon sheath should be opened throughout its length

The superficial lymphatics of the sole converge on the dorsum through the webs Thus when pus lies either superficial or deep in the sole inflammatory edema is most evident on the dorsum Usually this edema also involves the ankle less often it extends to the lower part of the leg In infection of the web space there is localized tenderness over the dorsal and the plantar aspect of the web It is drained through the plantar aspect of the space

With infections in the interdigital subcutaneous spaces the patient has increasing pain between the shafts of the two metacarpals that bound the infected space Soon walking is impossible Exquisite tenderness over the infected space proclaims the diagnosis Drainage must be placed away from the weight bearing area of the sole A hemostat is directed into the cavity filled with pus and its jaws are opened Tube drainage is required When extension into the

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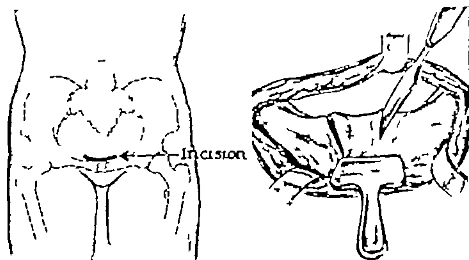


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is cleared about an inch from the midline both to the right and to the left. A wedge, with its apex pointing down, is resected from the symphysial junction (Fig 27) leaving enough bone to buttress the obturator foramen on either side. If any cavities are noted in the other bones they are curetted and a drain is inserted deep into the wound The skin edges and only these, are approximated with widely spaced interrupted wire sutures. Postoperative treatment consists of administration of appropriate antibiotics as ascertained by sensitivity tests and removal of the catheter and the drain when these are no longer needed, usually after about 4-6 days In case of persistent back strain, a sacrolumbar belt is prescribed

Infections of Foot are discussed by Hamilton Bailey[8] (London) Infected blister is a common infection of the foot When the temperature is normal and the contents of

(8) J Internat. Coll. S rgeons 27 475-482, April, 1957

the blister appear doubtfully purulent the blister can be aspirated after the whole foot has been cleansed If the fluid is opalescent penicillin is given and the fluid examined for bacteria A purulent blister should be incised

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With infections in the interdigital subcutaneous spaces the patient has increasing pain between the shafts of the two metacarpals that bound the infected space Soon walking is impossible. Exquisite tenderness over the infected space proclaims the diagnosis Drainage must be placed away from the weight bearing area of the sole. A hemostat is directed into the cavity filled with pus and its jaws are opened Tube drainage is required When extension into the

dorsal subcutaneous space has occurred a counterincision is required in the line of the tendons, nerves and vessels near the base of a toe

Infection in the heel space manifests itself by steadily increasing throbbing pain There is swelling of the soft tissues that cover one or both sides of the calcaneum tender ness over the heel space and possibly fluctuation Usually by the time the patient is seen the abscess is ready for in cision which is made at the side of the heel so the scar does not lie on a weight bearing area

Of the three deep fascial spaces in the sole—medial lateral and central—the first two are rarely infected. Pus deep in the sole causes swelling in the dorsum of the foot and ten derness of the instep For drainage of the central plantar space an incision about 1 in long parallel to and just above the medial border of the foot near the instep supplies a direct approach and free drainage and obviates a scar on the pressure bearing area of the sole Rest on a back splint with the leg raised is maintained 2 3 days or until the pulse and temperature are normal The dorsal subcutaneous space is usually infected by an extension of infection from a subcutaneous interdigital or a web space.

Eosinophilic Granuloma of Femoral Shaft Simulating Ewing's Sarcoma. A H McKenzie and F G Day[9] (Royal Alexandra Hosp Edmonton Alta) report 2 cases Eosinophilic granuloma a well localized usually single histologically distinct granuloma of unknown etiology originates in the medullary cavity of a bone and tends to expand erode and perforate the cortex The microscopic features are said *to allow easy differentiation of the nonlipoid histiocytoses* from other conditions Ewing s tumor and eosinophilic granuloma occur at a similar age (under 20) and may produce the same symptoms (pain tenderness loss of function and swelling) In Ewing s tumor such symptoms usually last for months whereas in eosinophilic granuloma they usually last for days or a few weeks In both x rays reveal rarefying lesions arising in the diaphysial medullary cavity expanding and eroding the cortex. Both lesions cause deposition of reactive new bone Not infrequently periosteal elevation occurs and lamination by periosteal new bone—

(9) J Bone & Joint Surg. 39-A 408-411, April, 1957

the so-called onionskin effect—appears Eosinophilic granuloma may be more sharply defined than Ewing's tumor but is often indistinguishable from it

CASE 1—Girl 3 was hospitalized because of intermittent pain in



Fig 23 – Preoperative x ray showing marked erosion of cortex, with perforation and external periosteal new bone formation. (Courtesy of McKenzie A. H. and Day F G. J Bone & Joint Surg 3 A 408-413 April, 1957)

the left knee for 3 months The upper portion of the left thigh was slightly tender and measured ½ in. less in circumference than the right. X rays of the left femur showed an area of radiolucency in the upper third with some periosteal new bone reaction. The consultants felt that clinical and x ray evidence pointed definitely to Ewing's tumor but surgical exploration and biopsy revealed a typical eosinophilic granuloma. After deep x ray therapy of 800 r follow up ex

amination and x rays showed complete return of painless function of the limb with calcification and reossification of the bony defect. No recurrence of the femoral lesion was evident 15 months after biopsy and no new lesions had appeared.

CASE 2.—Boy 2½ was hospitalized because of alleged injury to left lower extremity from a fall Slight swelling was noted in the midportion of the left thigh which measured ½ in. more in diameter than did the right thigh at that point Moderate tenderness was noted over the area of swelling but no redness of the overlying skin. X rays of the left hip revealed an area of radio lucency in the midshaft of the left femur involving both medulla and cortex. The involved area was surrounded by extensive periosteal new bone formation (Fig 28) The lesion was extremely active, suggesting malignant growth. Location and mode of growth were such as would be more readily expected in Ewing's sarcoma than in eosinophilic granuloma, and a provisional diagnosis of Ewing's sarcoma was made. At exploratory osteotomy the periosteum was five or six times normal thickness The periosteum and overlying tissue were slightly edematous and congested, and the underlying cortex was somewhat spongy The periosteum was easily stripped back and a cortical window was cut with ease. Soft, brown friable tissue was curetted from the medullary cavity Biopsy revealed an eosinophilic granuloma. Follow up x rays showed recalcification of the involved area.

► [The difficulty of making a correct diagnosis of a benign lesion, such as *eosinophilic granuloma of the shaft of the long bone of a child*, has resulted in needless mutilating surgery The diagnosis may be confusing even when adequate material is available for microscopic study Microscopic sections of an eosinophilic granuloma sent to three well known pathologists resulted in two erroneous diagnoses of malignant neoplasms. The clinical course and x ray appearance indicated benign lesion, which it ultimately proved to be. The diagnosis of a pathologist, regardless of how competent or famous he may be, based on study of microscopic sections without taking into account x ray picture, history and clinical findings, is not a sound basis for proceeding with an amputation or other mutilating operations This article emphasizes the danger of reliance on any one diagnostic technic, whether roentgenographic or microscopic.—Ed.]

Eosinophilic Granuloma of Bone in the shoulder of a woman aged 62 is reported by J George Teplick and Harold Broder[1] (Kensington Hosp Philadelphia) Apparently this is the oldest known person to develop eosinophilic granuloma The middle 50's is the oldest age recorded in the literature

The early roentgen appearance was atypical No clearcut bone defect was seen soft tissue calcification adjacent to the acromion and irregularity of the lateral tip of the acromion with spotty areas of demineralization were the roentgen findings Soft tissue swelling (typical) was also

(1) Am J Roentgenol. 78 502-507 September 1957

noted The rapid progression of the bone lesion and the unexpected involvement of an adjacent bone (clavicle outer end) were features of unusual interest Only 5 weeks intervened between the two film studies

The clinical features of progressive pain and disability and of soft tissue swelling in the shoulder were fairly typical of eosinophilic granuloma No systemic complaints or significant laboratory findings resulted from the local involvement

The histologic appearance of the bone lesion was typical of eosinophilic granuloma no lipophages or foam cells were seen The rigid criteria of Henderson Dahlin and Bickel were fulfilled, in that not more than two bones were involved and no foam cells were found histologically

Therapeutically a highly satisfactory result was achieved by irradiation Although a total of 2 000 r (in air) was given clinical improvement became apparent after 800 r Remarkable restoration of bone and soft tissue contours was seen 2 months after therapy was completed. The calculated tumor dose was nearly 1,800 r

Systemic Reticuloendothelial Granuloma. Per Westling, Kurt Sundberg and Gunnar Söderberg[2] (Stockholm) reviewed 16 cases of Hand Schuller-Christian disease eosinophilic granuloma of bone and Letterer Siwe disease. Recently these three conditions have been thought to be different forms of the same disease for which the designation systemic reticuloendothelial granuloma is suggested

Symptomatology is variable Fever occurs only with gross generalization A chronic course in children is sometimes associated with retarded development. In the localized form the sedimentation rate is normal or slightly elevated anemia is found most in the generalized forms There is often eosinophilia. Skeletal changes may appear early and only rarely are absent throughout Lesions are commonest in the cranium pelvis ribs and scapula Cranial lesions are usually accompanied by tender swelling Diabetes insipidus is a classic sign and is due to lesions in the region of the hypothalamus and hypophysis Visceral signs include enlargement of the liver and spleen

The bone lesions usually arise from the medulla Or

(2) Acta radiol. supp. 149 1957

x rays they appear as osteolytic destruction generally discrete and without endosteal reaction In advanced stages of the disease they may break through the cortical bone, probably due to pressure or by active breaking down Periosteal reaction occasionally occurs here Pulmonary x ray changes may consist of miliary infiltrations with no characteristic features They may subside spontaneously or lead to fibrosis

Radiotherapy can be given for both solitary and multiple lesions and several may be treated concurrently However *widespread changes in internal organs do not lend themselves to radiologic treatment* For fresh lesions in young patients a depth dose of 400-800 r over about 1 week is probably adequate Adults require higher doses The results in skeletal lesions are excellent Subjective distress tenderness and pain on movement subside rapidly Swelling of the soft tissues often attending lesions near the surface soon regress

End Results of Focal Debridement in Bone and Joint Tuberculosis and Its Indications From a study of 830 patients followed an average 9.2 years (1 21 years) Eishi Kondo and Kengo Yamada[3] (Kyoto Univ) conclude that when antituberculous drugs are combined with radical focal debridement the results obtained are remarkable.

Focal debridement is a rational form of therapy without streptomycin but in the treatment of trunk lesions it must be combined with streptomycin to minimize the dangers of the operation The results of this study show statistically that focal debridement combined with streptomycin advocated by the authors about 6 years ago is at present the best method of treatment. The superiority of this operation can be definitely proved postoperatively by the rate of healing of sinuses or abscesses by the course of the blood sedimentation rate and by x rays In most of the cases in which focal debridement was done firm bone ankylosis resulted after 1 2 years Arthrodesis may better be performed secondarily if needed but focal debridement should be done primarily

Experimental studies reveal that at this time the effect of antituberculous chemotherapy on bone and joint tubercu

(3) J Bone & Joint Surg. 39-A 27 31 January 1957

losis is still confined within certain limits The authors are pessimistic about the possibilities of obtaining functional restoration of tuberculous joints by arthroplasty without any recurrence of the disease and believe that further improvements in chemotherapy must be made before such operations are feasible

Skeletal Tuberculosis in Children Treated for Primary and Miliary Tuberculosis is discussed by Lillian Milgram[4] (New York Univ) Since bone tuberculosis mostly occurs early in the disease, it is now possible to judge the effect of therapy on the incidence of the condition The author studied bone and joint complications of children under age 13 who had x ray evidence of primary tuberculosis The patients were followed 2-8 years after tuberculosis was diagnosed Of special interest were those with miliary tuberculosis as there is pathologic, clinical and experimental evidence for the presence of extensive bone infection in that condition when untreated.

During follow up skeletal lesions occurred most often among survivors of miliary tuberculosis The incidence was low in children treated for indications other than miliary disease including those treated for skeletal tuberculosis and was lower than in an untreated group The complication was less frequent under streptomycin and isoniazid treatment than under treatment with the sulfone Promizole® Better drugs even when given for short periods as measured by current standards prevented much bone disease in the survivors This presumably resulted from the treatment of the unknown metastases the preclinical foci of tuberculosis of the bone

It is suggested that the bones are infected early in primary tuberculosis and that chemotherapy acts on already established foci There is evidence that at the beginning of treatment of miliary tuberculosis there is widespread involvement of the bone marrow Such foci probably explain the frequency of clinical bone tuberculosis in treated generalized tuberculosis

(4) Am Rev Tuberc. 75:897-911 June 1957

TUMORS CYSTS AND FIBRODYSPLASIA

Mineral Content of Bone Tumors and Its Influence on Radiation Tumor Dose were investigated by Helen Q Woodard and Ralph Phillips[5] (New York) The cure of cancer by radiation therapy presumably results from the combination of an irreversible injury to the malignant process with preservation of or at most a recoverable injury to the normal tissues It has been observed that the energy absorbed by the bone minerals themselves is not important biologically the biologic damage being due to the secondary electrons generated in the bone salt and adsorbed by nearby masses of soft tissue The relative amounts of damage due to the secondary radiation from bone salts that will occur in the soft tissues of osteogenic sarcoma and of normal bone depend on the relative dimensions of the soft tissue masses This is difficult to evaluate because of the variable structure of the tumor tissue although it probably is less in the tumor than in the normal bone. The absolute quantity of secondary radiation depends on the amount of bone salt present This can be determined by analysis of the tissues in question

The authors measured the calcium content and alkaline phosphatase activity of a variety of osteogenic sarcomas and of corresponding parts of normal bones In the bulk of most osteogenic sarcomas the amount of calcium seldom was more than one fifth and usually less than one twentieth of that in normal bone The alkaline phosphatase activities of different parts of the same tumor indicated the most heavily calcified portions usually contain the least actively metabolizing tumor tissue.

It is suggested that the use of those radiations of longer wavelength which are strongly absorbed by calcium will not appreciably add to the tumor dose in irradiation of osteogenic sarcomas Use of those radiations of shorter wavelength which are little absorbed by calcium will do much less damage to normal bone with the same tumor dose. The biologic effectiveness of radiations of different

(5) Am. J Roentgenol. 78 109 115 July 1957

wavelengths in the treatment of osteogenic sarcomas is unlikely to depend on their content of bone salts.

Trauma and Neoplasm: Report of Case of Desmoid Tumor Following Simple Fracture of Radius and Ulna is presented by Marshall R. Urist[6] (Univ. of California, Los Angeles). Desmoid tumor is a special benign fibroma derived from aponeurotic structures, ligaments and tendons, but it is characteristically not encapsulated and produces local invasion of muscle tissue. It has a false capsule or peripheral cleavage plane and microscopically shows extension of tumor tissue beyond the grossly recognizable outer edges of the neoplasm. Desmoma, desmal tumor, desmoid fibroma, fibrocytoma and perineural fibroblastoma are synonyms often used in the literature to describe this type of neoplasm. Keloids differ from desmoid tumors in that they are limited to skin and do not have an affinity for muscle. Fibrosarcoma differs in that it has a more cellular structure with mitotic figures, less intercellular substance and collagen and frequently recurs despite the most radical excision.

Boy, 8, had a transverse fracture of the radius and ulna at the junction of the middle and lower thirds of the forearm which healed uneventfully. From the time the cast was removed until the end of the 1st year there was a slight swelling at the lower end of the ulna. The swelling gradually increased and developed the appearance of a definite mass during a 2 year period. X-ray study showed erosion of the external surface of the growing compact bone. At operation, it was found that the tumor had invaded the muscle attachments on the ulna and was adherent to the sheath of the ulnar nerve. The tumor was excised with bone, periosteum, ligament, fascia, nerve and other soft parts into which it had grown. Microscopically it was found to be a desmoid tumor that invaded surrounding parts. To repair the nerve, it was necessary to transpose it from posterior to the anterior aspect of the elbow. There was no recurrence of the neoplasm 5 years after the fracture and 3 years after the operation. About 40% of the function of the ulnar nerve returned. Slight clawing was apparent in the ring and little fingers, but the patient could write legibly, play ball and had little residual disability.

Resection: Conservative Measure in Treatment of Bone Tumors is discussed by Bradley L. Coley[7] (Mem'l Hosp., New York). The following benign tumors offer opportunities for resection: osteochondroma, central chondroma, chondromyxoid fibroma, giant cell tumor and aneurysmal

(6) Am. J. Surg. 93:682-693, April, 1957.
(7) Am. Surgeon 23:13-18, January, 1957.



Fig 29 (left) —Resection, with substitution of massive tibial transplant to bridge defect. Patient had useful extremity 7 years postoperatively. (Courtesy of Coley B L. Am. Surgeon 23 13-18 January 1957)

Fig 30 (bottom) —Appearance of low-grade juxtacortical osteosarcoma when first seen after 3 unsuccessful attempts at local removal. (Courtesy of Coley B L. Am. Surgeon 3 13-18, January 1957)



bone cyst Resection may also be done in selected cases of malignant tumor including low grade fibrosarcoma of bone secondary chondrosarcoma and low grade juxtacortical osteosarcoma (parosteal osteoma)

Segmental resection with restoration of bone continuity by means of massive graft (Fig 29) is of value in carefully selected cases of low grade fibrosarcoma chondrosarcoma or juxtacortical osteosarcoma (Fig 30), especially in the forearm bones or humerus Resection of a circumscribed low grade secondary chondrosarcoma of the scapula or iliac bone is occasionally practical Total resection of the scapula may be required for more extensive tumors Low grade juxtacortical osteosarcoma of major long bones deserves at least one attempt at resection if the size and anatomic setting are suitable If recurrence supervenes amputation should not be deferred Resection and bone graft usually are not advisable for tumors that have been heavily irradiated because of damage to the blood supply of the area involved

Aneurysmal Bone Cyst Its Roentgen Diagnosis is discussed by Robert S Sherman and Kenneth Y Soong[8] (Mem l Center New York) on the basis of 43 cases These cysts present a varied roentgen appearance. The roentgen findings are influenced by the bone involved site of involvement, age of the patient, duration of the disease and effect of treatment Although practically any bone may be involved the sites of predilection are the tubular bones vertebrae and pelvis

Three principal roentgen types were found in the tubular bones eccentric, parosteal and central The eccentric and central types were further subdivided into diaphysial and metaphysial The vertebral column is a frequent site of aneurysmal bone cyst. Of 6 such cases in the present series 4 were in the lumbar spine and 1 each in the thoracic spine and sacrum The neural arch appeared to be the site of predilection as the laminae were involved in every instance The lesion usually eccentric in position began as an area of rarefaction with little or no internal structure and barely discernible borders Eventually an expanding multiloculated process was noted extending into the soft parts with

(8) Radiology 68:54-64 January 1957

'eggshell borders (Fig 31) When the vertebral body was involved it usually collapsed sooner or later in the course of the disease. The natural history of aneurysmal bone cyst contains three stages early or lytic mature or characteristic appearing and calcified

Regardless of the roentgen type the lesion presents the greatest diagnostic problem when noted in its early stage



Fig. 31 —Aneurysmal bone cyst in lumbar spine. (Courtesy of Sherman R. S., and Soong K. Y Radiology 68:54-64 January 1957)

Some confusion with malignant bone tumors especially periosteal fibrosarcoma is inevitable at times Special care must be exercised to identify the usual smooth distinct intraosseous boundary of the lesion even though the outer or extraosseous boundary appears disrupted or absent.

Surgical treatment varies from curettage to complete resection Roentgen therapy (2 000 r in 2 weeks) was given to 8 patients with a single failure

► [Some orthopedic surgeons and bone pathologists are beginning to wonder whether the incidence of this interesting, and at times alarming, tumor is increasing Comparatively few were correctly diagnosed, or

were described under some other terminology before 10 years ago Forty three histologically proved aneurysmal bone cysts from one hospital or clinic constitute a remarkable series. This interesting report and résume should be studied by every orthopedic surgeon, pathologist and roentgenologist who is called on to see diagnose or treat bone tumors.—Ed.]

Aneurysmal Bone Cyst Observations on 50 Cases are presented by Louis Lichtenstein[9] (Wadsworth Gen'l Hosp Los Angeles) These cysts apparently result from some

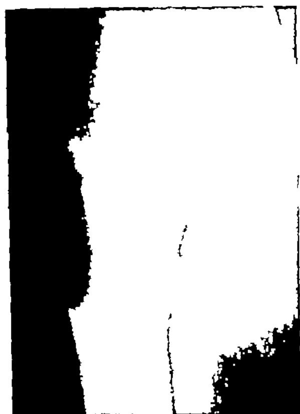


Fig. 32.—Aneurysmal bone cyst as it appeared originally in intertrochanteric region of femur in man, aged 23 Lesion was curetted and packed with bone chips. (Courtesy of Lichtenstein, L. J Bone & Joint Surg. 39 A 873-882, July 1957)

persistent local alteration in hemodynamics leading to increased venous pressure and subsequent development of a dilated and engorged vascular bed within the transformed bone area. The affected bone site ultimately resembles an expanded blood filled sponge which may attain impressive size The roentgen picture is sufficiently distinctive at least in large limb bones and the vertebral column (the commonest sites of localization) to suggest the diagnosis in most

(9) J Bone & Joint Surg. 39-A 873-882, July 1957

cases The affected bone area is characteristically more or less expanded appearing cystically transformed and often eccentrically ballooned-out to a striking degree

Of the 50 cysts 18 were in long bones particularly the femur (Fig 32) and ulna and 13 were in the vertebral column The others were in the following sites clavicle 2 rib 2 scapula 1 innominate bone 5 skull 3 hand bones 3 and foot bones 3 About two thirds of the patients were children or adolescents

For relatively small or moderate sized lesions in readily accessible sites curettement and packing with bone chips is probably the treatment of choice. Curettement should be as thorough as the situation permits If the surgeon is deterred from complete curettement by disconcerting bleeding supplementary roentgen therapy is indicated Relatively deep seated or surgically inaccessible cysts may be treated with roentgen therapy alone A total dose of 1 400 r should suffice for effective control Larger doses than are necessary should be avoided because of the potential hazard of development of sarcoma in the irradiated site

Early diagnosis and appropriate prompt treatment are important in aneurysmal bone cysts in a vertebral body If x ray changes suggest aneurysmal bone cyst prompt conservative biopsy is indicated More extensive surgery with a view to substantially complete extirpation is unnecessarily hazardous As soon as the diagnosis is established by a pathologist familiar with the condition roentgen irradiation in moderate dosage is indicated before the lesion grows much larger

Benign Osteoblastoma according to Henry L Jaffe[1] is a peculiar rather vascular osteoid and bone forming benign tumor of bone characterized cytologically by the abundant presence of osteoblasts It is rather uncommon Although the tumor affects limb bones it seems to have a predilection for the vertebral column Complaints and findings vary with the location of the lesion When it is in some part of the vertebral column pain or backache usually become overshadowed by neurologic difficulties Complaints from a lesion in a long or short tubular bone consist mainly of some dull aching pain Usually the affected bone part be-

(1) Bull Hosp Joint Dis 17 141 151 October 1956.

comes visibly enlarged through the presence of a palpable tumor mass Local tenderness is generally not severe If the bone affected is involved in weight bearing the patient may limp

The x ray appearance may vary from patient to patient in accordance not only with the size of the lesion but with



Fig. 33 (left) —Benign osteoblastoma in spinous process of 3d cervical vertebra of boy 16. Affected bone part is expanded, somewhat trabeculated and presents some mottled radiopacity When lesional area was entered surgically it was completely filled with deep red, friable and gritty tissue.

Fig. 34 (right) —Benign osteoblastoma involving 2d metacarpal bone in man, 48. Lesional area is expanded, somewhat trabeculated and radiolucent. Resected metacarpal bone showed affected area to be occupied by dark red, friable, somewhat granular tissue, which histologically was composed of poorly calcified osteoid set in vascular substratum.

(Courtesy of Jaffe, H. L.: Bull. Hosp. Joint Dis. 17 141 151 October 1956.)

the extent to which the lesional tissue is calcified. The contour of the bone in the affected area is likely to be expanded (Figs 33 and 34)

The variations in histologic detail between one lesion and another and various parts of the same lesion reflect variations in the evolutionary sequences within the lesion. Always the basic tissue consists of a loosely fibrillar and highly vascular matrix or substratum rich in osteoblasts.

As to the variations in some lesions or parts of lesions agglomerated nests cords or sheets of osteoblasts are a conspicuous feature of the tissue pattern In other areas of the same lesion intercellular material sometimes appears between these proliferated masses of osteoblasts and osteoid trabeculae become delineated About the peripheries of the trabeculae some small osteoclasts may be seen In an area showing further progression of the histologic changes the osteoid trabeculae having become calcified may be transformed into trabeculae of primitive osseous tissue In many places this tissue may undergo osteoclastic resorption in the process of reconstruction into more mature tissue. Nevertheless numerous osteoblasts may be seen everywhere bordering on the thin walled blood vessels and apposed on the osseous trabeculae in the reconstruction

In other lesions or lesional areas the osteoblasts in the vascular osteoblastogenic substratum lay down trabeculae of osteoid without first becoming hypertrophied and agglomerated into nests or cords The trabeculae are lined by osteoblasts but also show osteoclasts which are subjecting them to resorption In still other lesions or lesional areas the trabeculae may fuse into wide sheets which often appear heavily calcified These sheets and plaques of osteoid are poor in cells However they form a matrix which in some areas may eventually transform into relatively mature osseous tissue

Though the histologic tissue patterns of benign osteoblastoma and conventional osteoid-osteoma mimic each other in a general way the number of osteoblasts is much greater in the former Also the benign osteoblastoma is consistently a larger lesion than the osteoid-osteoma Osteogenic sarcoma may be differentiated from benign osteoblastoma in that in the latter the stromal cells are small plump sarcomatous connective tissue cells mitoses are rare, sarcoma giant cells are absent tumor cartilage is not formed anywhere and the cells enmeshed in the osteoid matrix are all small

The treatment of choice for benign osteoblastoma is excision of the lesional area This is not technically feasible in lesions of the vertebral column Even if the area is only

partly curetted however the lesion can be made to ossify and heal through moderate x ray therapy

► [This article emphasizes once more the fact that the mere presence of giant cells in a bone lesion does not justify a diagnosis of giant cell tumor —Ed.]

Giant Cell Tumor of Bone A historic review of giant cell tumor as well as the works of Jaffe Lichtenstein and Portis published in 1940 are discussed by William Anderson[2] (Univ of Toronto) The former authors carefully defined giant cell tumor as a clinical and pathologic entity, dividing it sharply from a number of so-called variants with which it had been and still is, confused

Although there is fairly universal agreement about the lack of preponderance of giant cell tumor in either sex there is no such agreement on the age incident or location The gross appearance of these tumors is somewhat dependent on their age and state of progression Usually the tumor affects the end of a long bone and adjacent metaphysis and is often eccentrically placed In the affected area the bony cortex is expanded and represented by a thin shell of bone over which the periosteum is stretched and thickened In most instances the tumor tissue is uniformly dark red and friable although in its more cellular areas it may have the classic fleshy gray appearance of sarcomatous tissue. Cystic degeneration is not a common feature of the lesions unless they have become large and have been the site of extensive necrosis and hemorrhage.

The microscopic details of classic giant cell tumors are also dependent on the age and size (and concomitant degenerative changes) of the lesion but a basic cellular pattern is recognized. This consists of an intimate admixture of stromal cells with multinucleated giant cells set in a usually well vascularized but otherwise poorly developed supporting matrix. The stromal cells are spindle or ovoid in outline with a correspondingly shaped nucleus and usually a well defined nucleolus The multinucleated giant cells are well represented and average 60-100 μ in size

At times giant cell tumors with the most innocuous appearance may recur or even metastasize, but the cellular

(2) Am. J M Sc. 234:334-341, September 1957

and structural features of more ominous portent outlined by Jaffe Lichtenstein and Portis in their reluctant advocation of numerical grading have been substantiated by others

In lesions arbitrarily designated grade I these cells show no significant atypism as to size staining intensity or nuclear variation The occasional mitotic figures present are normal The giant cells are numerous and their nuclei exhibit an equal lack of atypical features The supporting matrix shows little tendency for collagenous differentiation.

The tumors of grade II are the most difficult to assess exhibiting a progressive atypism of stromal cells mirrored to a degree in the nuclei of the giant cells which however remain large and plump The atypical features are nuclear hyperchromicity variation in size and increased mitosis some of which is abnormal

The small group (about 15%) of tumors not included in the preceding groups constitutes the obviously and frankly malignant grade III lesions In these the giant cells are small and sparse and the stromal cells tend to be compact in an irregular whorled arrangement Their nuclei show variable degrees of atypism which is often marked enough to warrant the term anaplastic.

Proposed therapeutic measures for this tumor include excision curettage irradiation alone and irradiation with curettage but it has become increasingly obvious that until uniformity exists in nomenclature and designation reports about the efficacy of various forms of treatment are insignificant.

Giant Cell Tumor of Patella Hampar Kelikian (Northwestern Univ) and Irvin Clayton[3] (Wesley Mem'l Hosp Chicago) add 2 cases to the 26 found in the literature The patella is an uncommon site for giant cell tumors which occur fairly frequently in other bones The microscopic appearance of these tumors is the same regardless of the bone or portion of b ne involved Most pathologists agree that it is difficult t stinguish between benign and malignant giant cell tum n the early stages When the lesion appears in a disp able bone such as the patella prognosis is improved.

(3) J Bone & Joint Surg 39-A 414-420 April, 1957

The appearance in one of the authors patients is shown in *Figure 35* Of the 28 patients aged 15-45 17 were women Though most patients gave a history of trauma before or coincident with onset of symptoms it is doubtful that injury plays any role in the etiology of the lesion However a patella invaded by an osteolytic lesion such as a giant cell tumor would be more liable to fracture Obviously, a



Fig 35 —Pneumoarthrogram shows encroachment of knee joint cavity by soft tissue mass Patella is expanded and completely involved with tumor (Courtesy of Kehkian, H., and Clayton I J Bone & Joint Surg. 39 A 414-420, April, 1957)

crack through the articular surface of the patella allows tumor cells to infiltrate into the joint and to start foci of secondary invasion by direct extension This should not necessarily be regarded as evidence of malignant degeneration of the giant cell tumor of the patella.

Of the 26 tumors reported in the literature 3 were treated by amputation 6 by curettement 1 by partial excision of the patella and the others by total excision of the bone. The 3 recurrences occurred after curettement 2 of the patients were reported as being well after further curettement and

the other died of metastases to the lungs 6 years after discovery of the lesion In 25 no extension of the tumor to the surrounding soft tissues was reported

When the tumor is confined to the patella total excision should be done because the patella is easily resected and the tumor can be completely removed Patients with extension to surrounding soft parts must be treated according to microscopic appearance of the tumor Amputation is indicated when there is evidence of malignant degeneration. Patellectomy should be combined with synovectomy if the joint has been invaded by the lesion provided there is no suspicion of malignant growth

Nonosteogenic Fibroma of Bone is more common than generally believed according to Clinton L. Compere and Sherman S Coleman[4] (Chicago) Roentgenologically it represents one of the most distinctive lesions of the skeleton It is consistently metaphysial and eccentric in location It may consist of a very small oval defect in the periphery of the cortex or may extend into the medullary cavity occupying a considerable width of the bone or it may involve the entire thickness in such thin bones as the fibula ulna and radius It is radiolucent and usually longer than it is wide The periphery is sharply demarcated from the surrounding bone The larger lesions often exhibit irregular smooth loculations separated from the marrow cavity by a thin scalloped zone of sclerotic bone The loculations are more apparent than real being represented by ridges of increased density in the wall of the lesion

Microscopically the principal component is fibrous tissue intermingled with a variable number of giant cells The fibrous tissue is uniform and benign containing whorls and bundles of spindle cells The giant cells are consistent in size (Fig 36) having a pale blue cytoplasm and containing usually 3-10 nuclei in each cell It is not uncommon for these lesions to be mistaken for giant cell tumors particularly when the patient s age location of lesion and radiographic picture are not known by the pathologist. Histologically however the resemblance of this lesion to true giant cell tumor of bone is only superficial and with careful study differentiation should be easy Other microscopic features

(4) Surg., Gynec & Obst 105 588 598 November 1957

of nonosteogenic fibroma include hemorrhage hemosiderin cholesterol slits and focal collections of xanthoma cells One of the important distinguishing features is absence of any bone formation within the lesion per se this obtains in all cases not complicated by fracture.

Attention is often drawn to the lesion after some form of trauma and the first symptom is a fracture in a sizable

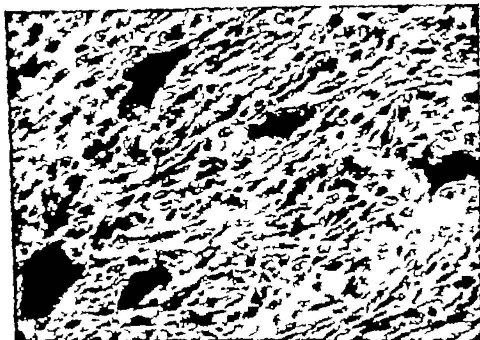


Fig 36.—Section of nonosteogenic fibroma of bone showing giant cells and spindle cell stroma; reduced from ×197 Cells of stroma are oval and spindle shaped, benign in appearance and uniform in size. There are no mitotic figures. Giant cells exhibit 5 15 nuclei/cell and are relatively clearly separated from surrounding stroma. (Courtesy of Compere, C. L., and Coleman, S. S. Surg., Gynec. & Obst. 105 588-598 November 1957)

number of cases Most lesions are asymptomatic but mild symptoms may be present when the lesion occurs at the site of a muscle or tendinous attachment Nonosteogenic fibroma of bone is identified most frequently in persons between ages 8 and 20 Of 20 lesions studied by the authors 5 were in the distal femur 6 in the proximal tibia 8 in the distal tibia and 1 in the fibula There were 7 females and 13 males

The lesion is probably a developmental defect possibly belonging to the hamartoma group of lesions These lesions do not become malignant and do not recur after removal

Each lesion must be treated individually. Small symptomless lesions which do not increase in size may be observed at intervals without great concern if the radiographic picture is typical. Lesions which produce symptoms, those which are unusually large and those through which a fracture has occurred should be removed. They should be excised en bloc or curetted thoroughly. If the defect is significant in size, it should be packed with bone chips to hasten



Fig. 37 (left).—Typical nonosteogenic fibroma on distal tibia of girl, 11. Curettement and bone grafting were performed.
Fig. 38 (right).—Ossification of lesion 1 year later.
(Courtesy of Compere, C. L., and Coleman, S. S.: Surg., Gynec. & Obst. 105:583-598, November, 1957.)

healing and promote future strength of the bone (Figs. 37 and 38). Postoperative x-ray therapy is neither advisable nor necessary, and it may be harmful.

► [The authors of this article have emphasized the importance of making correct diagnosis of each bone lesion which contains giant cells. A nonosteogenic fibroma is one of many lesions which has been carelessly and erroneously called a giant cell tumor.—Ed.]

Nonosteogenic Fibroma of Bone is discussed by Raphael R. Goldenberg[5] (St. Joseph Hosp., Paterson, N.J.). Most patients with this tumor are older children or adolescents. There is no sex preponderance. The lesion is usually eccentrically situated in the metaphysial region of a long weight-bearing bone not far from the epiphysial cartilage. The

(5) Bull. Hosp. Joint Dis. 17:230-250, October, 1956.

tumor is commonly found in the femur tibia and fibula and less commonly *in the ulna* humerus and radius Since the lesion develops slowly and often disappears spontaneously there may be no clinical signs or symptoms Pain associated with swelling in the contiguous joint may be the presenting symptom Although the tumor may have been present for



Fig. 39—Multilocular areas of reduced density in *femoral* metaphysis *with* delimiting sclerotic margins. Proximal end of lesion is expanding and bulging cortex. (Courtesy of Goldenberg R. R.: Bull. Hosp Joint Dis. 17 230-250, October 1956.)

several months pain in the long bones is usually a recent development. Occasionally the patient is unaware of any disturbance until a local trauma is followed by pain tenderness and swelling

The periosteum covering the lesion shows little or no thickening except in those instances where the cortex has been resorbed, producing a cortical defect or at the site of a pathologic *fracture undergoing* repair In the former (cortical defect) the periosteum is thickened and its fibrous

tissue extends into and is continuous with the lesion The gross appearance of the cortex of the affected portion of the shaft will vary with the age and activity of the lesion The involved cortex may be eroded and thinned in some areas and considerably thickened in others The histologic pattern consists of whorling bundles of spindle cells interspersed with small multinucleated giant cells and the consistent absence of bone formation

In most cases of nonosteogenic fibroma of bone the lesion may be recognized by x rays either as an eccentrically placed sharply marginated oval area of rarefaction abutting on the cortex on one side in the metaphysial region of a long tubular bone or as an expanding multilocular area of rarefaction producing a bulging of one cortex (Fig 39) Trabeculation may be seen within the lesion

Although surgical excision will effect a cure biopsy and operative intervention should be reserved for patients with clinical signs or problems in diagnosis

Fibrous Metaphysial Defect of Bone Crawford J Campbell and James Harkess[6] (Albany Med College) studied 20 males and 6 females aged 4-21 with one or more fibrous metaphysial defects in whom spontaneous regression or healing occurred in all but a few In 19 the location was the distal femoral metaphysis usually in the posteromedial portion The site of involvement was the proximal tibia in 5 patients the distal tibia in 4 and the proximal humerus in 1 Pathologic fractures in 3 patients healed without complication Diagnosis was made by x rays Curettage or block excision resulted in healing in the 4 patients treated in this manner

By x ray the lesion appears as an oval or elongated area of reduced density located eccentrically in the metaphysis of one of the more rapidly growing long bones (Fig 40) The border is scalloped and usually slightly sclerotic The defect is usually oriented in alinement with the long axis of the bone and may lie entirely within the cancellous bone of the metaph[illegible] or partially in the cortex. Sometimes it may be situa[illegible] in the outer margin of the cortex under the periosteum It i[illegible] most often located in the posteromedial aspect of the d[illegible]stal femoral metaphysis Serial x rays may

(6) S[illegible] Gynec. & Obst 104 329-336 March, 1957

demonstrate obliteration of the defect by a gradual filling in of bone

The smooth walled and often loculated cavity within the bone contains a firm white fibrous tissue with yellowish or brownish spotty areas Microscopically this tissue consists of mature connective tissue in whorled bundles with interspersed small and sometimes elongated multinuclear giant cells Areas of old hemorrhage with scattered collections of hemosiderin loaded macrophages may be found Lipoid



Fig 40.—X-rays of boy aged 14, taken for symptomatic Osgood Schlatter's disease of tibial tubercle, reveal ovoid scalloped defect eccentrically located in tibial metaphysis. It is surrounded by thin shell of sclerosis, and there is no reaction in regional bone. (Courtesy of Campbell, C. J., and Harkess, J : Surg., Gynec. & Obst. 104: 329-336, March, 1957)

filled macrophages appear in lesions that have been present for a long time. Centrally in the lesion there are usually no bone trabeculae Marginally newly formed reactive bone may be seen and in some regions active osteoclasis of the old bone The appearance of multiple foci and concurrent osteochondritic lesions suggests a common systemic etiology The authors prefer the descriptive term "fibrous metaphysial defect of bone" as suggested by Hatcher for this lesion since it identifies the location and the nonneoplastic fibrous tissue origin of this entity

► [The lesions described would be diagnosed by most orthopedic surgeons, as nonosteogenic or nonossifying fibromas. The lesions are not always the area immediately adjacent to the epiphysial line. Pe

nate closer to the epiphysial line and as growth occurs are left behind. Many will prefer to continue to consider this a fibroma of the nonossifying or nonosteogenic type and to designate it by that name.—Ed.]

Lipoma of Tendon Sheath. C Roger Sullivan, David C Dahlin and Richard S Bryan[7] (Mayo Clinic and Found.) report 2 cases and review the literature. Only 43 similar cases have been reported since 1922. Of these 43, 18 occurred in males and 19 in females, the sex being unknown in the other 6. Age varied from 6 to 70. The symptoms were pri-

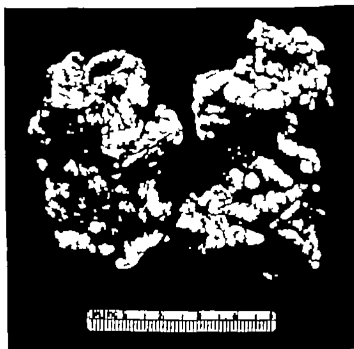


Fig. 41.—Inner surface of tendon sheaths showing pedunculated polyp-like lipomatous masses in arborescent lipomas. (Courtesy of Sullivan, C. R., et al.: J. Bone & Joint Surg. 38-A: 1275-1280, December, 1956.)

marily those associated with any tumor of the soft tissues and most patients had mild aching pain in the affected part. Occasionally an acute inflammatory condition was present with swelling, redness and warmth of overlying tissues. Crepitus of the soft tissues was often noted. Symptoms were often aggravated by overuse of the affected extremity.

In 30 patients the lipomas occurred in the hands and wrists only and in 9 in the feet and ankles only. Two had tumors of the upper and lower extremities and 1 of these

(7) J Bone & Joint Surg 38-A: 1275-1280, December, 1956.

had arborescent lipomas on both hands and both ankles In 14 the neoplasm was bilateral In 2 cases there was no information on the site of the lesion Often several tendons in one limb were involved Extensor tendons appeared to be affected oftener than flexor

One of the authors patients was a man, aged 33 with a mass on the dorsum of the right wrist first noted 2½ years previously The other was a woman aged 39 with a painful mass on the anterior surface of the left ankle noted 18 years previously and a mass on the anterior surface of the right ankle noted 2 years previously that caused occasional dull pain in the area. In both patients the tumors had increased in size and caused pain and swelling

At surgery the tumor is seen as a soft mass palpable under the skin along a tendon sheath Distention of the sheath due to effusion may be noted Surgical exposure of the exterior surface of the sheath may reveal a smooth glistening mass that looks much like the lipomas found ordinarily in other parts of the body but the color is more often orange than the usual yellow After the sheath is opened typical villous and nodular projections may be seen (Fig 41) These vary in length from 1 to 3 or 4 mm and have a glistening orange or yellow surface Occasionally degenerated and hyalinized villi lie as loose bodies within the sheath Both the arborescent and simplex symmetricus forms of the tumor are composed of finely lobulated and vesicular fatty tissue which grows from the sheath and grossly is indistinguishable from it The distinguishing feature of the arborescent type lipoma seems to be the presence of villi

Popliteal Cyst Clinicopathological Survey is presented by R. Joe Burleson, William H Bickel and David C Dahlin[8] (Mayo Clinic and Found.) Of 198 patients with popliteal cyst seen from January 1944 through December 1953 82 had 83 operations with total excision of the cyst The patient usually had showed a mass and aching pain in the region of the knee More than a fifth of the 82 patients were under age 16 Although other disease of the knee joint which was associated with the cyst in 45% of the 198 pa

(8) J Bone & Joint Surg. 38-A:1265-1274 December 1956.

tients apparently did not predispose to recurrence of the cyst postoperatively it seemed to increase the chance of having trouble with the joint after operation

At operation 46 of the 83 cysts seemed to arise from bursa 26 from hernia and 11 from indeterminate sites (Fig

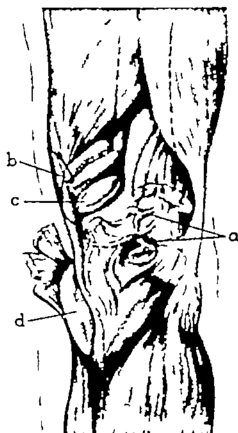


Fig. 42.—Common origins of popliteal cyst *a* herniation of posterior capsule above and below oblique popliteal ligament; *b* semimembranosus bursa, lying between semimembranosus and medial head of gastrocnemius; *c* gastrocnemius bursa, lying beneath medial head of gastrocnemius and *d*, anserine bursa, lying beneath tendinous insertion of pes anserinus. (Courtesy of Burleson, R. J *et al* J Bone & Joint Surg 38-A 1265-1274 December 1956.)

42) Communication of the cyst with the joint was evident in 54 27 of these being hernial in origin 22 being bursal and 5 being indeterminate Failure to close the capsule when the cyst communicated with the knee did not seem to predispose to recurrence Pathologically the cysts were classified as fibrous synovial inflammatory or in a few instances transitional No particular type of lining characterized the bursal or hernial cyst Though only 5 patients had recur

rence of the cyst 27 showed persistence of symptoms to some degree 21 of the 27 had associated disease of the knee joint

The name popliteal cyst seems preferable to the names used heretofore regardless of where the cyst arises because all these lesions apparently behave alike clinically and pathologically have the same indications for treatment and terminate similarly

Roentgenographic Recognition and Differentiation of **Parosteal Osteogenic Sarcoma** was studied by G Melvin Stevens David G Pugh and David C Dahlin[9] (Mayo Clinic and Found) in 19 patients

Parosteal osteogenic sarcoma is an unusual type of primary malignant densely ossified tumor of the bone that arises and proliferates juxtacortically The average patient reports a slowly growing firm painless mass that eventually limits motion of the joint A dull ache may develop later or the patient may note arthralgia particularly in changeable weather A history of antecedent trauma was obtained in about a third of the patients Frequently there was a history of tumor excision one or more times Each time the tumor was said to be benign but nonetheless it recurred Common features were a predilection for the popliteal space and a tendency to encircle the shaft



Fig. 43 —Roentgenographically typical tumor shows radiolucent zones of fibrous and cartilaginous tissue within bulk of lesion, and free space between tumor and cortex and uninvaded cortical outline. (Courtesy of Stevens, G M et al Am J Roentgenol. 78 1 12, July 1957)

The main distinguishing roentgen characteristics are the encircling dense lobular and juxtacortical nature of growth failure of the lesion to destroy the cortex heterogeneity of

(9) Am J Roentgenol. 8 1 12, July 1957

ossification and failure to produce periosteal elevation A thin free space between the tumor and the cortex often is noted with proper degree of obliquity of the view (Fig 43)

Recurrence of the tumor after local excision is almost universal which is similar to the seeding problem encountered in chondrosarcoma The tumor usually re forms in the image of the primary lesion

Differential diagnosis includes myositis ossificans osteochondroma parosteal ivory osteoma sclerosing osteogenic sarcoma ossifying hematoma and exuberant callus When pathologic confirmation is lacking the x ray features in typical advanced cases are reliable enough to base treatment on this diagnosis alone

Of the 19 patients 13 are living One of these apparently was cured by local excision 4 had primary amputation and 8 had one or more local excisions followed by amputation Six patients died after local excisions and amputation 5 from metastasis Average time from recognition of the tumor until death was 20 years This is a striking contrast to average survival in other forms of osteogenic sarcoma

Primary Malignant Tumors of Bone J F Tracey H H Brindley and R. A Murray[1] (Scott and White Clinic, Temple Tex.) reviewed the records and pathologic material of 33 cases of primary malignant bone tumors During 1922 53 51 patients with multiple myeloma were observed.

Exclusive of multiple myeloma osteogenic sarcoma was the primary malignant bone tumor oftenest seen Nine of 13 patients with this lesion died within 24 months of initial treatment and another within 30 months Only 2 survived for more than 5 years and 1 of these died apparently from metastases after about 11 years

Of 8 patients (all under age 25) with Ewing s sarcoma, none survived 5 years If many patients with this lesion are to be cured treatment other than surgery and radiation will have to be found

The better prognosis for chondrosarcoma is indicated by the survival of 3 of 7 patients for 5 years or more after diagnosis was made 3 of the 7 were over age 60 and 5 over age 45 Probably the presence of osteoid and calcific deposits

(1) J Bone & Joint Surg 39-A 554-560 June, 1957

has caused roentgenologists orthopedists and pathologists to designate many of these tumors as osteogenic sarcoma. The distinction is important because of the better prognosis of chondrosarcoma.

There were 5 patients with fibrosarcoma Only 3 had adequate surgical treatment and 2 of the 3 died less than a year after surgery The 3d has survived 4 years and is apparently free from disease

Fibrosarcoma of Bone was studied by John J McLeod David C. Dahlin and John C Ivins[2] (Mayo Clinic and

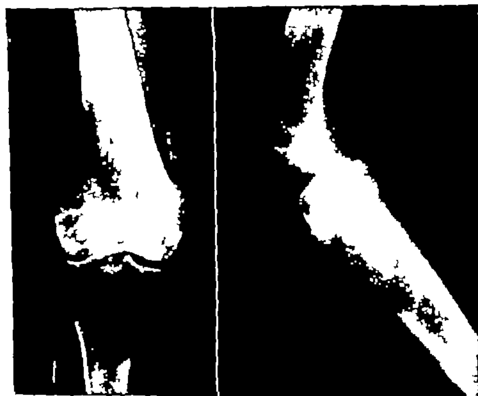


Fig. 44 (left) —Fibrosarcoma of lower end of femur
Fig. 45 (right) —Fibrosarcoma of tibia.
(Courtesy of McLeod, J J., et al.: Am. J Surg. 94 431-437 September 1957)

Found.) in 50 patients (27 women 23 men) Average age at diagnosis was 38½ years Unmixed fibrosarcomas of bone constituted only 2% of the primary tumors of bone observed. Long bones were involved in 34 patients and 52% of the lesions occurred in the femur or tibia More than 80% of the lesions in the femur or tibia were situated near

(2) Am. J Surg. 94 431-437 September 1957

the knee (Figs 44 and 45) There was evidence of origin of the fibrosarcoma in a benign tumor of the bone in 12 patients In 10 of these secondary sarcomas occurred after long intervals of latency following therapy for proved benign giant cell tumors (Fig 46) In 9 of the 10 patients therapy included *ionized irradiation* This emphasizes the fact that irradiation is not without danger in the treatment of benign osseous disease

There was an average time differential of about 6 months

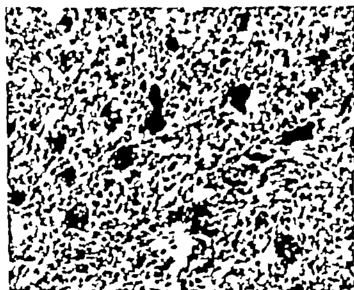


Fig 46.—Benign giant cell tumor treated by curettage and radiation. Hematoxylin-eosin, reduced from ×175 (Courtesy of McLeod, J J., *et al*: Am J Surg 94 431-437 September 1957)

from onset of pain to onset of swelling This indicates there is considerable opportunity for earlier diagnosis in this disease Local tenderness with or without a palpable mass was most frequently present over the involved area and in some there was increase in local heat

The roentgen picture is not pathognomonic. The lesions are osteolytic As the tumor enlarges the periosteum may be elevated and there may be some reactive formation of new bone Cortical destruction occurs and as extension proceeds involvement of soft tissues results (Figs 44 and 45)

Fibrosarcoma in bone has the same histologic features

as fibrosarcoma in soft tissue except it may be observed to destroy bone Distinction of pure fibrosarcoma from the fibroblastic type of osteogenic sarcoma can be made on histologic grounds but the distinction is chiefly of didactic significance

Eight patients were treated less than 5 years ago Of the other 42 1 could not be traced and 11 lived longer than 5 years a 5 year survival rate of 26.8% Three of the 11 who lived longer than 5 years however died of metastatic tumors in the 6th and 7th years after treatment Analysis of therapeutic results indicates that amputation is the treatment of choice for this radioresistant tumor There was no evidence that irradiation is of value The study of fresh frozen sections at time of operation is important

Postradiation Fibrosarcoma Developing in Case of Osteoclastoma is reported by D J Reddy K Gopalakrishniah Gupta T Suryaprakasa Rao and C Ethirajulus (Guntur India)

Woman 22, had a slowly enlarging painful nodule on the left forearm. One year later a fracture occurred at the site of the lesion at which time biopsy showed osteoclastoma. Roentgen therapy was given during the next 2 weeks (total dosage of 2000 r) Later excision and bone grafting were done and 3 more courses of x ray therapy of unknown dosage were given. When first seen by the authors about 4 years after onset of the giant cell tumor the patient had a large, rapidly growing ulcerated tumor on the left forearm An x ray revealed complete destruction and irregular calcification of the bones in the region. A chest x ray showed no metastasis. The forearm was amputated and microscopic examination confirmed the clinical diagnosis of sarcoma. The patient died 2 months after discharge from the hospital the exact cause of death was not known.

Excessive doses of radiation appear to be the most significant factor in the production of sarcoma at the site of pre-existing osteoclastoma There is a wide range of variation in individual sensitivity to ionizing radiation The authors advise excision rather than irradiation of giant cell tumors of bone whenever possible

► [Giant cell tumors should be surgically excised when possible. Large giant cell tumors cannot be destroyed by irradiation alone without extensive injury to the adjacent tissues which have not been invaded by tumor cells. Many cases of postradiation sarcoma have been reported. —Ed]

(J) Indian J Surg 19 10-213 June, 195

Chondrosarcoma of Upper End of Femur Radiotherapy Resection of Epiphysis Acrylic Prosthesis and Late Result (6 Years) M Salmon[4] reports an interesting case.

Boy 12 had had progressive pain and limited motion in the right hip for 2 years but no definite diagnosis had been reached. X rays



Fig. 47 (left) —Defect in inferior portion f neck at cervicodiaphysial junction. Lesser trochanter has disappeared. Periosteal spurs appear above and below cavity

Fig 48 (right) —X ray 18 months after operation shows good coaptation of prosthesis in acetabulum. Prosthesis is fitted to diaphysis by double acrylic and metallic cylinder Diaphysial stem i perfectly calcified.

(Courtesy of Salmon, M. Rev chir orthop. 42 621-629 Oct. Nov., 1956.)

every 3 months during this period remained practically unchanged. An x ray then showed a destructive lesion with a periosteal spur at each end (Fig 47) interpreted as probable neoplasm Exploratory arthrotomy and biopsy revealed chondrosarcoma. X ray therapy (total dosage 6,000 r) was given and an operation done 5 months later

A prosthesis simulating the upper end of the femur was constructed with orifices for reinsertion of psoas and gluteal muscles. At the lower end junction was made in two cylindric planes, the

(4) Rev h orthop 4 621 629 Oct. Nov., 1956.

external one being supported on the circumference of the femor shaft and the internal one (smaller cylinder) penetrating the in terior of the femur across the medullary canal This was supported on a sort of console resulting from widening of the diaphysial canal permitting a good acrylic-diaphysial fit (Fig 48) with prosthesis bone pressure well distributed thus diminishing the risk of bone resorption

At operation, care was taken to preserve the nerve supply to the muscles The operation was facilitated by first sectioning the femur and then performing the disarticulation. The muscles were identified and sectioned one by one. The periosteum was not removed from the femoral diaphysis in order to preserve the periosteal circulation.

The result 6 years later is excellent, with no metastasis a solid extremity and normal joint mobility There is a 6-cm shortening of the leg involving the whole length, predominantly the thigh. The foot is shortened 2 cm Atrophy of the thigh amounts to 5 cm The acrylic prosthesis has been tolerated exceedingly well with no pain and no sign of reaction.

The prognosis must remain guarded because of the possibility of late metastases of chondrosarcoma and rupture of the prosthesis

Primary Tumors of Ribs and Sternum Chris A Pascuzzi David C Dahlin and O Theron Clagett[3] (Mayo Clinic and Found) reviewed the clinical and operative records micro-scopic sections gross specimens and x rays of 126 primary tumors of the ribs and 18 of the sternum Two thirds of the tumors were in males There were 86 neoplasms of the ribs and 17 of the sternum which were malignant

Chondrosarcoma is the most frequently encountered primary tumor of the ribs and sternum Except for osteochondromatous exostosis benign cartilaginous tumors of the rib cage are extremely rare

Pain and swelling are the commonest symptoms The spinal cord is involved in some cases from extension of malignant tumors of posterior segments of ribs Also a tumor of the 1st or 2d rib may impinge on the brachial or cervical plexus and cause referred symptoms Asymptomatic tumors of the ribs are more likely to be benign than malignant Recurrence is almost always a manifestation of malignancy

The tumors occur most commonly near the costochondral junctions of the upper five ribs About 25% of the tumors of the ribs in this series were found in one of the first two ribs and about 25% involved posterior segments of ribs

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(3) Surg Gynec. & Obst. 104 390-400, April, 1957

Ribs in the right hemithorax were the site of involvement in 80 instances

Radical or en bloc resection is the treatment of choice for primary malignant neoplasms of the ribs and sternum. Local recurrence of a low grade chondrosarcoma need not preclude ultimate survival of the patient Solitary myeloma occurring in a rib or the sternum must be given a guarded prognosis

Malignant Angioblastoma of Bone Reappraisal of Adamantinoma of Long Bone is made by George W Changus J S Speed and Fred W Stewart[6] (Sloan Kettering Inst.)

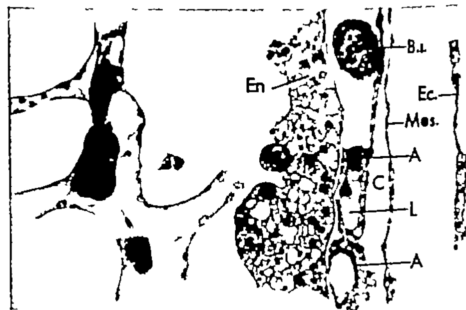


Fig 49—Living blastoderm of chicks in 2d day of incubation grown for several hours in Locke-Lewis solution: mesenchymal cells (*Mes*) angioblasts (*A*); endothelial wall (*E*), blood islands (*B I.*); lumen of vessel (*L*) Two isolated angioblasts on left are actually in continuity with vessel wall. (Courtesy of Changus, G W *et al* Cancer 10 540-559 May June, 1957)

The rare and perplexing tumor involving the limb bones, especially the tibia which closely simulates the adamantinoma found in the jaw bones has provoked varied theories concerning its genesis The authors observations on 8 tibial tumors and the reappraisal of recorded adamantinomas suggest that no true epithelium exists in these tumors and that angioblasts or primitive vascular mesenchymal cells are their primary components

(6) Cancer 10 540 559 May June 1957

The angioblast is the anlage of the blood vessels Sabin was able to trace the formation of blood vessels back to their beginning She observed the differentiation from the mesoderm of a new cell type, the angioblast. She stated that these angioblasts form solid clumps then bands or cords of cells which soon unite in a plexus by the well known method of sprouting The central part of the substance either of the isolated clumps or the plexus of angioblasts then liquefies leaving a rim to form the endothelial wall



Fig. 50 (left) —Obvious blood vessels containing red blood cells. Lumina of blood vessels are lined by endothelial angioblasts and surrounded by mesenchymal angioblasts. Most of tumor consisted of mesenchymal angioblasts containing islands or cords of proliferating endothelial angioblasts without distinct lumina. Other areas had reactive bone formation simulating fibrous dysplasia.
Fig 51 (right) —High power view of same tumor
(Courtesy of Chaurus, G. W *et al.* Cancer 10.540-559 May June 1957)

of the vessel In this liquefaction both cytoplasm and nuclei are involved and the resulting fluid constitutes the first *blood plasma* (Fig 49) The right side of Figure 49 depicts a portion of the area opaca taken from a chick incubated 42½ hours and grown for 2 hours in a Locke Lewis solution It shows the process of liquefaction of angioblasts to make vessels On the left is tissue taken from the lower end of the developing aorta of a chick incubated 52¾ hours in Locke Lewis solution Nearly all normal tissue changes described by Sabin are recognizable in the malignant angioblastomas as almost similar changes (Figs 50 and 51) The vascular origin of these tumors is also confirmed by positive demonstration of alkaline phosphatase in the

thelium The liquefaction of angioblasts and emergence of endothelial angioblasts was noted in these tumors

There was sufficient histologic and photomicrographic documentation in 25 of 27 recorded adamantinomas of long bones to allow reclassification as malignant angioblastomas.

The designation of malignant angioblastoma is advantageous because it describes a tumor arising from tissue normally present in bone and precludes speculation as to other sources of origin it can be closely related to the normal embryonic origin of blood vessels its histochemical reactions are similar to those of normal blood vessels its histologic pattern which stems from the angioblast can be well defined its potential malignancy can be inferred from the microscopic changes it encompasses nearly all the recorded adamantinomas of long bones and finally the designation of malignant can be construed only as indicative of capability of recurrences and metastases

Primary Reticulum Cell Sarcoma of Bone Robert Schobinger[7] (Roswell Park Mem l Inst., Buffalo) points out that for a new growth originating in bone to be classified as primary reticulum cell sarcoma of bone certain well-established criteria should be fulfilled (1) The primary focus should originate in a single bone (2) The malignant character of the lesion must be established by biopsy of the bone itself (3) The pattern should be histologically similar to reticulum cell sarcoma arising in other tissues (4) A long natural history of the disease should exist during which time general symptoms such as debility and loss of weight, are rarely observed (5) Metastatic lesions if present on admission should be strictly limited to the regional lymph nodes or their appearance should follow the primary lesion by not less than 6 months (6) The neoplasm should be highly radiosensitive

The condition may appear at any age but is noted most often during the 4th decade Duration of symptoms universally extends over many mouths Local swelling pain, disability and clinical evidence of nerve involvement are the most frequent complaint Local tenderness is not a usual feature nor is redness or local increased temperature. Many patients show pathologic fractures that may or may not

(7) Am J Surg 93 414 January 1957

produce pain Any bone may be involved but there is some predilection for the lower extremities and pelvic girdle upper extremities and shoulder girdle and vertebrae and head in that order of frequency Metastases are common in the regional lymph nodes and have been reported in other bones subcutaneous tissues lungs and brain

Roentgenograms as a rule show the tumor arising in the medullary cavity of the bone The lesion is predominantly osteolytic and destructive Initial extension is within the bone rather than into the soft tissues the involved bone tends to appear patchy and mottled Reactive proliferation of bone is often observed

Use of intra arterial injection of radiopaque material is of great value in differentiating benign from malignant lesions In malignant neoplasms the arteries are of irregular caliber take a tortuous course and often show abnormal distribution Capillaries are abundant within the tumor and there is formation of puddles of dye. Arteriovenous fistulas may be noted When performed properly arteriography is followed by no untoward effects No claim is made as to the replacement of biopsy by arteriography

Radiation therapy alone and surgery followed by irradiation of the regional lymph nodes are the most popular therapeutic approaches for reticulum cell sarcoma of bone and appear to yield similar results Metastatic lesions are best treated by radiation The survival rate tends to be favorable

Primary Reticulum Cell Sarcoma of Bone Presentation of Five Cases According to Mortimer Housberg and Abel Kenins (Brooklyn Jewish Hosp) the constantly present ing symptoms are moderate pain comparative well being in the presence of relatively large bone lesions in contra distinction to chronic low-grade fever fatigability and weight loss associated with malignant bone tumors and the generalized form of reticulum cell sarcoma

Although there are no specific x ray findings for primary reticulum sarcoma of bone destruction with a mottled patchy appearance is a usual finding in early cases The lesion is medullary in origin often with poorly defined margins Cortical destruction varies from fine irregular areas

(8) Am J Surg. 94 584-593 October 1957

to wide sections of erosion The cortex is not expanded, nor is periosteal reaction a prominent feature Soft tissue involvement is often found The cell of origin is the reticulum, its histologic appearance being indistinguishable from the generalized form The cell is about twice as large as a

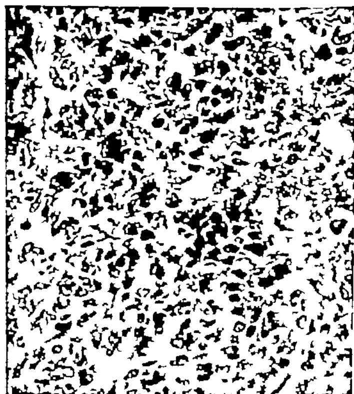


Fig 52.—High power photomicrograph of tumor cells. Large round and oval cells with hyperchromatic nuclear staining and tendency to form small groups. (Courtesy f Housberg, M. and Kenin, A. Am. J Surg. 94 584-593 October 1957)

lymphocyte with an indented or lobulated nucleus and variable hyperchromatism The reticulum network contains isolated or small groups of tumor cells as contrasted to Ewing's sarcoma in which the reticulum fibers circumscribe larger areas of tumor cells

CASE 1 —Man, 46 had sudden onset of pain in the proximal third of his right leg for 3 months Examination disclosed a small nodule over the proximal third of the tibia. An x ray revealed a mottled and patchy osteolytic tumor in the proximal third of the tibia, with an anterior cortical defect Bone biopsy showed large round and oval cells with hyperchromatic nuclear staining There were a moderate number of mitotic figures (Fig 52) The patient was treated with

tri-ethylmelamene and radiation After 30 months, he is living and well and x rays show the previous area of biopsy regeneration of bone and increased cortical density (Fig 53)

Case 2—Boy 5 had intermittent pain in the left ankle for 10 months An x ray disclosed rarefaction in the distal medullary cavity A biopsy showed a primary reticulum cell sarcoma. He was treated



Fig 53—Thirty months after radiation. Note area of biopsy with surrounding area of increased cortical density and bone regeneration. (Courtesy of Housberg, M. and Kenm, A. Am. J Surg. 94:584-593 October 1957)

with high voltage radiation and is living and well 18 months after therapy

Case 3—Boy 11 had intermittent pain in the right thigh for about 4 years with local tenderness and warmth about the midthigh. X rays revealed sclerosis of the posterior cortex, some scalloping within the medullary canal and some rarefaction within the sclerotic cortex. Because low-grade osteomyelitis was suspected, saucerization of the femur was performed. The marrow cavity was filled with granulation tissue. Microscopic examination showed reticulum cell sarcoma. The patient was treated with radiation He was well for 18 months until he broke the right femur in a fall On open reduction, no tumor was found.

Case 4—Man 26 had intermittent pain in the left thigh for 1 year X rays of the midthigh revealed some rarefaction of the cortex

with scalloping within the medullary cavity Microscopic examination of a biopsy specimen revealed reticulum cell sarcoma. On the basis of the original diagnosis of Ewing's sarcoma, a hip disarticulation was done.

CASE 5—Woman 51 had intermittent pain in the right leg for 8 months. An x ray showed an area of rarefaction in the anterolateral aspect at the proximal end of the tibia. A soft tissue mass was present associated with some erosion and periosteal reaction around the fibula. A biopsy specimen from the tibia revealed reticulum cell sarcoma. The patient received x ray treatment but pulmonary metastasis and pleural effusion occurred 5 months later

Primary reticulum cell sarcoma can easily be confused with Ewing's tumor metastatic neuroblastoma osteomyelitis and the osteolytic type of osteogenic sarcoma

Osteogenic Sarcoma. Mark B Coventry and David C Dahlin[9] (Mayo Clinic and Found) analyzed 430 cases. Osteogenic sarcoma was seen 2-8 times as often as chondrosarcoma fibrosarcoma and reticulum cell sarcoma In incidence it is surpassed only by myeloma Osteogenic sarcoma is defined as a malignant bone tumor the neoplastic cells of which produce osteoid This definition avoids the unsettled controversy concerning the exact origin of these tumors

Osteogenic sarcomas fall into three groups depending on the predominant differentiation observed microscopically in various parts of the tumor osteoblastic chondroblastic or fibroblastic It is usually possible to make a clearcut distinction between chondrosarcoma and chondroblastic osteogenic sarcoma In the latter the malignant cells in at least some areas show definite direct production of osteoid tissue. There are also significant clinical differences between osteogenic sarcomas of the chondroblastic type and chondrosarcomas Unmixed chondrosarcomas occur at an older age have a predilection for different bones and show a slower clinical evolution with less tendency to metastasis (Fig 54)

Figure 55 shows the anatomic distribution of the osteogenic sarcomas More than half were in the knee region and only 8 in the bones of the hands or feet Although the disease is seen at any age 46 9% of the patients were aged 10-19 Osteoblastic osteogenic sarcoma was the commonest form (50%) followed by chondroblastic (27%) and fibroblastic (23%) Only 7 were secondary to Paget s disease

(9) J Bone & Joint S 39-A 741 758 July 1957

Follow ups were possible in 97% of the patients 19.3% survived 5 years and 15.3% 10 years from the date of definitive treatment. Of patients with lesions readily amenable to amputation (below the upper third of the femur), 22.8% survived 5 years and 17.6% 10 years The 5 year survival rate for patients with tibial lesions was 34.6% and for those with lesions of the middle and lower parts of the femur 17% Those with osteoblastic tumor had the poorest

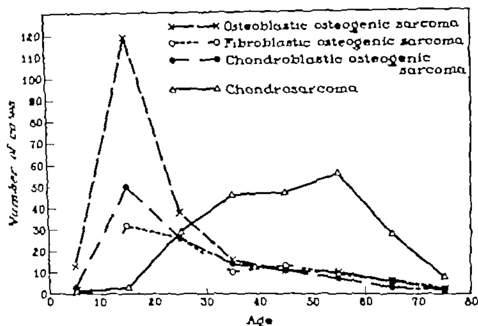


Fig 54—Age distribution of patients with osteogenic sarcoma and chondrosarcoma. Note increased incidence of chondrosarcoma in older age groups. (Courtesy of Coventry M. B., and Dahlin, D C. J Bone & Joint Surg 39 A 741 758, July 1957)

5-year survival rate (15.6%) The 5-year survival rate of nearly 20% for the entire group is significant if compared with other data showing lower survival rates The present series has statistic significance because of the large number of patients followed

Early surgical ablation is the most successful treatment Radiation therapy is often used along with surgery In suspected osteogenic sarcoma of the extremities two tourniquets are applied one above the tumor and one above the proposed site of amputation After diagnosis is established by examination of fresh frozen sections of biopsy material amputation is performed between the tourniquets This pre

cludes the possible dissemination of tumor emboli during biopsy. Practically all osteogenic sarcomas have soft parts from which a diagnosis can be made readily by fresh frozen section technics.

The florid phase of myositis ossificans may be troublesome in the differential diagnosis if only the histology is

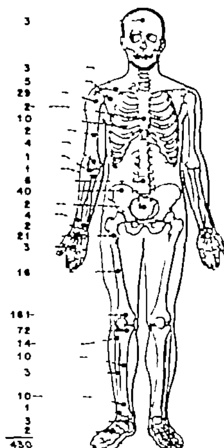


Fig 55 —Anatom distribution f osteogenic sarcomas. (Courtesy of Coventry M. B and Dahlin, D C J Bone & Joint Surg 39-A:741-758 July 1957)

considered The extraosseous location and lack of true anaplasia in the proliferating cells should suggest the correct diagnosis. Fibrous dysplasia and giant osteoid osteoma (nonosteogenic fibroma) may exhibit mitotic figures but the proliferating cells lack the anaplasia required for a diagnosis of osteogenic sarcoma. Giant cell tumors must also be considered in the diagnosis. About one fourth of osteogenic sarcomas contain multinucleated giant cells and many

giant cell tumors contain foci of osteoid production The anaplasia of the stroma is the essential diagnostic point

Osteogenic Sarcoma of Skull Following Irradiation E M Sholnik E. J Fornatto and J Heydemann[1] (Univ of Illinois) report 2 cases In the first the sarcoma developed in the temporal bone of a youth 20 3½ years after irradiation of a postauricular keloid and was surgically resected In the second the tumor developed in the frontal bone of a girl 11 10 years after irradiation of a retinoblastoma and was inoperable

The relative youth of the patients, the minimum dosage of 3 000 r the prolonged mode of irradiation and a latent interval of at least 3 years were important factors in the development of the osteogenic sarcomas of the skull These neoplasms have no definite characteristic clinical manifestation and challenge early diagnosis by their rapid growth Malignant degeneration should be suspected if a localized swelling or mass develops in a region previously irradiated particularly if associated with skin alterations pain and functional disturbances Osteogenic sarcomas of the skull following irradiation have no radiologic feature that can justify a specific diagnosis The main characteristics are the presence of a soft tissue mass bone destruction with cortical involvement, periosteal reaction and eventually complicating fractures X ray study is fundamental to confirm the clinical impression location and extension of the soft-tissue prominence it may offer a diagnosis of malignant tumor and guide biopsy of the neoplasm It is of utmost importance in follow up of these disorders

Osteogenic sarcoma designates a highly malignant neoplasm derived from cells analogous to osteoblasts Its essential feature is the formation of osteoid tissue directly by the malignant osteoblasts with no intermediate fibrous or cartilaginous matrix. The presence of cartilage or giant cells does not exclude the diagnosis No definite histologic characteristic could be demonstrated in the osteogenic sarcomas of the skull following irradiation

Wide surgical resection appears to be the treatment of choice. Palliative irradiation may be of relative significance.

(1) Ann. Otol., Rhin. & Laryng. 65:915-936, December 1956.

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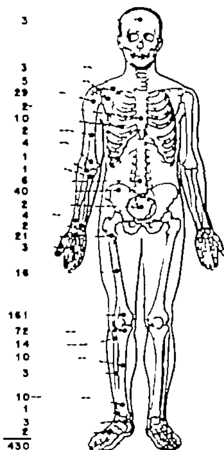


Fig. 55.—Anatomic distribution of osteogenic sarcomas. (Courtesy of Coventry, M. B. and Dahlin, D. C.: J. Bone & Joint Surg. 39-A:741-758, July 1957.)

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giant cell tumors contain foci of osteoid production The anaplasia of the stroma is the essential diagnostic point

Osteogenic Sarcoma of Skull Following Irradiation E. M Skolnik E. J Fornatto and J Heydemann[1] (Univ of Illinois) report 2 cases In the first, the sarcoma developed in the temporal bone of a youth 20 3½ years after irradiation of a postauricular keloid and was surgically resected In the second the tumor developed in the frontal bone of a girl, 11 10 years after irradiation of a retinoblastoma and was inoperable

The relative youth of the patients the minimum dosage of 3 000 r the prolonged mode of irradiation and a latent interval of at least 3 years were important factors in the development of the osteogenic sarcomas of the skull These neoplasms have no definite characteristic clinical manifestation and challenge early diagnosis by their rapid growth Malignant degeneration should be suspected if a localized swelling or mass develops in a region previously irradiated particularly if associated with skin alterations pain and functional disturbances Osteogenic sarcomas of the skull following irradiation have no radiologic feature that can justify a specific diagnosis The main characteristics are the presence of a soft tissue mass bone destruction with cortical involvement periosteal reaction and eventually complicating fractures X ray study is fundamental to confirm the clinical impression location and extension of the soft tissue prominence it may offer a diagnosis of malignant tumor and guide biopsy of the neoplasm It is of utmost importance in follow up of these disorders

Osteogenic sarcoma designates a highly malignant neoplasm derived from cells analogous to osteoblasts Its essential feature is the formation of osteoid tissue directly by the malignant osteoblasts with no intermediate fibrous or cartilaginous matrix. The presence of cartilage or giant cells does not exclude the diagnosis No definite histologic characteristic could be demonstrated in the osteogenic sarcomas of the skull following irradiation.

Wide surgical resection appears to be the treatment of choice. Palliative irradiation may be of relative significance

(1) Ann. Otol., Rhin. & Laryng. 65:915-936, December 1956.

Roentgenologic Diagnosis of Osteogenic Sarcoma Osteomyelitis Report of Case is presented by Marja Ti nen[2] (Kivela Hosp Helsinki)

Man 54 with diabetes mellitus, had shoulder pain, first diagn as periarthritis After local injections of hydrocortisone, inflam tory symptoms appeared in the shoulder On roentgen examina osteogenic sarcoma was diagnosed. Later symptoms of osteomy were dominant. Osteomyelitis treatment was without benefit. Bi revealed giant cell sarcoma complicated by osteomyelitis. Amp tion of the right extremity was performed Death occurred in a 7 months due to metastases

The greatest difficulty in roentgen diagnosis of osteog sacroma is caused by osteomyelitis Each condition n usually occurs in the period of greatest growth in lengtl the bone and each has the same favorite localization in metaphysis of the long bones In the early phase osteog sarcoma causes roughening of the bone surface and irre lar destruction of the spongiosa In its most typical fo it reveals both osteolysis and additional bone formation sides osteosclerosis in the bone matrix there is reac periosteal bone formation in the growing end of the tu after the tumor has grown under the periosteum and lo ened it from the cortex In x rays this appears as a trian lar formation on either side of the bone separated fi the bone by a narrow zone negative to x rays and cau by the tumor which has loosened the periosteum Destr tion and sclerosis as well as reactive periostitis also are volved in osteomyelitis Schinz pointed out that diagn is safe only when the tumor grows in soft parts and sh spicules typical of sarcoma developing peripherally H ever spicules also may occur in mild chronic infection bone osteolymphogranulomatosis metatases and subp osteal hematomas Like the reactive periosteal trian spicule formation is primarily an attempt of the perioste loosened by an expansive process to renew destroyed bo whether the expansive process is tumor infection or hyp plasia of the marrow Formation of spicules thus is a n specific symptom of bone diseases only In the autho patient, spicules did not appear despite the far advan tumor

(2) Ann. chir et gynaec Fenniae 46.253-261 1957

Multiple Myeloma Diagnosis and Management in Series of 57 Cases are discussed by John J Kenny and William C Moloney[3] (Boston City Hosp) These cases seen during the past 9 years led the authors to conclude that multiple myeloma is not an extremely rare disease

Diagnosis is not difficult pain anemia and weight loss in an older person especially if accompanied by unexplained albuminuria should arouse suspicion Physical findings are not helpful except for the rare occurrence of palpable tumor masses and diagnosis usually depends on laboratory assistance.

Although rouleau formation rapid sedimentation rate and elevated serum globulin are highly suggestive myeloma cells in bone marrow aspirate Bence Jones protein in the urine and the characteristic serum and urine electrophoretic patterns are of special diagnostic significance. X ray evidence of bony abnormalities was present in a high percentage of the cases The occurrence of osteolytic lesions and pathologic fractures is of particular importance

At present there is no effective therapy for multiple myeloma Cortisone or ACTH used in 16 cases was not helpful. Local intense x ray therapy to sites of pathologic fracture resulted in relief from pain and healing of fracture in 2 cases Urethan was used extensively in this series and about 20% of the patients benefited The survival time was not increased by its use although 4 patients receiving long-term therapy had prolonged remissions Although it is not certain that this was a direct result of urethan therapy patients with multiple myeloma should be given an adequate trial with the drug

Multiple Myeloma Review of 26 Cases is presented by Edward E. Harnagel Irmgard Kleinberg Samuel C Kahlstrom and Florence V Rhudy[4] (California Hosp Los Angeles) Multiple myeloma is a rare, malignant disease of bone marrow which affects principally the vertebrae, ribs pelvis and skull but may involve any part of the skeleton Severe demineralization and destructive lesions of bones producing severe pain and debility are distinctive features

(3) Am. Int. Med. 46 1079 1091, June, 1957
(4) California Med. 87:237 243 October 1957

The disease is further distinguished by abnormal blood proteins and in some cases by urinary excre Bence Jones protein which seldom if ever, is ass with any other disease.

X ray examination is helpful In 22 of 24 cases in films were available definite abnormalities were Spontaneous fractures particularly of vertebrae ar mon

The diagnosis of the disease rests on identification myeloma cell This is best accomplished by aspirat bone marrow In several of the 26 cases diagnosis wa by a neurosurgeon at the time of operation to reliev sure on the spinal cord The myeloma cell has a cha istic appearance

In this series average survival after onset of sym was 9 months although 1 patient lived for at least 10

Sarcomas of Pelvis—Hemipelvectomy F James Jr and Sterling Jernigan[5] (Atlanta Ga) review th year experience with 4 patients Sarcomas of the pelv ally are painful They rarely are amenable to x ray t or chemotherapy and as a result invariably present tressing problem

CASE 1 —Woman, 36 had a large, irregular firm mass in adductor area in the proximal thigh X rays revealed a so mass with calcification that appeared to extend into the tru and displace the abdominal contents. Biopsy revealed fibros At hemipelvectomy the tumor appeared to extend distally and mally from the obturator foramen. The patient had an exceller operative course. She was put in a wheel chair on the 9th d was ambulatory on the 11th day Follow up examinations sho recurrence (Fig 56)

CASE 2.—Man 70 had pain in the left hip and thigh for 3 r Needle biopsy of the femur showed fibrosarcoma. One week la had a pathologic fracture that was nailed. Fixation was poo continued in the region of the femoral fracture and in the i When the ilium was removed, it was found that the malignan crossed the sacroiliac joint and invaded the wing of the sacrum too was resected, but the tumor extended well into the body sacrum and removal was impossible Postoperatively he di except for a temporary urinary fistula. Palliation was excelle the 3d day he was more comfortable than during the preop weeks During succeeding months he was largely free fro and was cheerful Death occurred about 6 months later

(5) J.M.A. Georgia 46 333-335 July 1957

the cancellous bone and areas of osteoporosis mixed with areas of increased density Complete collapse of a vertebral body may occur (Fig 57) Different bones in the same person may show different types of lesions

In lymphosarcoma the affected bones play a less significant role in morbidity than in Hodgkin s disease. The



Fig. 57 —Hodgkin s disease with complet collapse of vertebral body (Courtesy of Rubenfeld, S. Bull. Hosp. Joint Dis. 17:271-280 October 1956.)

vertebrae ribs and pelvis as in Hodgkin s disease are the bones most frequently involved The process is dominantly destructive

Bone changes in leukemia are uncommon in adults but common in children They may be either osteoblastic or osteolytic Cortex destruction is likely Periosteal reaction may sometimes simulate Ewing s tumor especially in children

The occasional case report describes bone involvement in reticulum cell lymphosarcoma No characteristic features are delineated There is no classic feature of osseous involvement in Brill Symmers disease

Pain may be severe and the danger of pathologic fracture imminent X ray therapy is the best local measure No time

dose level is to be pursued Instead the patient s expression of pain relief will constitute the single criterion for dosage level It is important to limit the dose below skin tolerance With high energy radiation such as 2 000 000 volts or cobalt skin damage is not produced and high dose levels may be administered with greater facility

Primary Lymphangioma of Bone. Sture Falkmer and Gunnar Tilling[7] (Univ of Upsala) report a case

Laborer 55 with a history of backache, on roentgen examination



Fig 58.—Lateral view of lumbar spine. Anterior part of arch of 4th lumbar absent. Posterior boundaries of bodies of 4th and 5th lumbar show excavation. (Courtesy of Falkmer S., and Tilling, G.: Acta orthop. scandinav 26-99-110 1956.)

(7) Acta orthop. scandinav 26-99-110 1956.

was found to have osteolytic changes in the lumbar spine (Fig 58) sacrum and right ilium with enlargement of the nutrient canal of the ilium The changes appeared partly in the form of complete erosion of certain parts and partly as coarseness of structure in general At operation no changes were noted in the tissues adjacent to the destroyed bone. Biopsy specimens from some of the diseased parts showed histologically many thin walled vascular spaces apparently restricted to the bone marrow and periosteal tissue. The changes were compatible with a cavernous lymphangioma which was assumed to bear an intimate relation to the lymphatics accompanying the blood vessels of the bone

The postoperative course was uneventful. Roentgen therapy was tried 2 courses of 6×300 r and 4×300 r being given. No symptomatic improvement occurred A corset was supplied, and the patient was instructed to rest. No improvement was evident at follow up 3, 9 and 12 months later and x rays showed the same picture as at operation

Rhabdomyosarcoma in Children Malignant tumors of striated muscle are rare A total of 230 cases of rhabdomyosarcoma have been reported in the literature Ten tumors developed in the tongue 27 in the muscles of the arm and none in the face They are especially rare in children.

Victor M Arean and Raul A Marcial Rojas[8] (San Juan P R.) report 3 cases in children The tumor arose in the floor of the mouth of a newborn girl in the arm of a girl aged 5 and in the mandibular area of a boy aged 4 In the last patient the brain was also invaded

Histologically the tumors showed differentiation of varying degrees only to about the level of fetal muscle. In the first and second cases the tumors were highly anaplastic, and although some differentiation occurred much of the growth was bizarre and scarcely imitated normal muscle development (Fig 59) one tumor metastasized and the other apparently did In the third case the tumor recapitulated the development of skeletal muscle much more faithfully Even the most primitive elements were not bizarre as in the other cases for they still mimicked embryonal patterns of growth considerably The growth of the tumor in the brain relatively free from connective tissue and uncomplicated by normal muscle demonstrated these levels of differentiation especially well Despite local growth this tumor did not metastasize.

Various derivatives of the so-called skeletal blastema

(8) Am J rg 93 143-146 January 1957

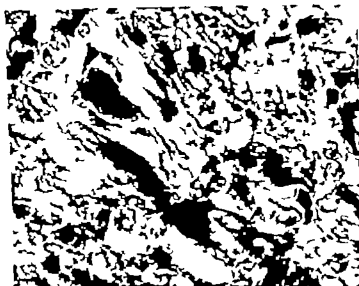


Fig. 59 — Rhabdomyosarcoma in newborn infant, showing anaplastic tumor cells and occasional differentiation to striated muscle. Phosphotungstic acid hematoxylin stain; reduced from × 830 (Courtesy of Arein, V M., and Marcial Rojas, R. A. Am. J Surg 93 143-146 January 1957)

including muscle may appear in mesenchymal tumors in children and adults In sarcomas that invade muscular regions differentiation of residual normal muscle fibers from those that are truly neoplastic is sometimes difficult In the authors cases differentiation was at a lower level of development (fetal and embryonal)

Malignant Tumors of Buttocks Survey of 46 Cases is presented by E M McConnell[9] (Liverpool) The tumors were divided into primary tumors of bone—sarcomas and chordomas soft tissue sarcomas metastatic carcinomas primary skin tumors and those in which the exact nature was in doubt The youngest patient was a few months old and the eldest over 80 The incidence of associated bone disease principally Paget s disease and of trauma were significantly increased in the bone sarcomas

The commonest presenting symptoms were pain, in the lower back or of sciatic distribution and swelling Pain with or without accompanying gluteal swelling was invariably a complaint of patients with primary or secondary neoplastic involvement of the pelvic bones this included the primary malignant tumors of bone and some of t

(9) Brit. J Surg 44:113-126, September 1956.

metastatic carcinomas When the tumor was confined to the soft tissues swelling usually without pain in the initial stages was the presenting symptom The duration of symptoms before medical advice was sought correlated to some extent with the tumor group—longest in primary skin cancers shortest in bone sarcomas and the metastatic carcinomas and intermediate in chordomas and soft tissue sarcomas (usually between 1 and 2 years)

Except for the skin carcinomas the tumors grew large, and large residual or recurrent ulcerated tumors were present terminally in most patients Local recurrences were removed on one or more occasions from 4 of 10 patients

Metastatic growth occurred in all patients in the miscellaneous group in 2 of whom the tumor disseminated via the lymphatic system and in 2 via the blood stream Widespread metastases were present in 5 of 6 patients with secondary carcinoma dissemination occurred by both the lymphatic and blood systems in each of these 5

Trauma may have some bearing on the etiology of bone sarcoma A definite history of antecedent trauma to the part was given by 5 of 20 patients The predisposition of patients with bone disease particularly osteitis deformans to bone sarcomas was borne out in this series in which associated bone disease was present in 7 of 20 patients with sarcomas of bone Except for the skin carcinomas prognosis was poor the survival times for the different groups varied between a few months and several years

Soft Tissue Sarcomas of Extremities and Trunk Clinical and Pathologic Study based on 146 cases is presented by M V Sirsat[1] (Bombay) There were 88 cases (60.3%) of fibrosarcoma Three fourths of the patients were aged 30-50 years (average 38.8) The tumor most often occurred in the lower extremity with the thigh the commonest site. Metastase occurred in 21 9% of the cases Local recurrences were observed in 73 9% The high recurrence rate (68.9%) in the entire series of 146 cases is attributed to inadequate initial surgical treatment

The series included 30 cases (20 5%) of rhabdomyosarcomas of skeletal muscles The tumor was predominantly seen at ages 41 50 and showed a definite predilection for

(1) Indian J Surg 18 251 270 August, 1956

the lower extremity the thigh being involved most frequently (30%)

Microscopic structure gives an important clue to the probable behavior of soft tissue sarcomas Generally, rhabdomyosarcomas and synovial sarcomas have a poor prognosis Undifferentiated sarcomas have a rapid clinical course. In these pulmonary metastases are early and the tumor invariably kills the patient.

Liposarcomas were seen in 6 men and 1 woman Four tumors occurred on the lower extremity and one each on the back axilla and shoulder Three patients had a recurrence after operation Two had metastases to lymph nodes and 1 to the lungs Microscopically the tumors were either undifferentiated or well differentiated

Reticulum cell sarcomas were present in 4 males and 2 females aged 18-35 The tumor recurred after removal in 4 The microscopic characteristics in all were essentially similar The tumor was composed of cells with round, ovoid, indented or lobulated nuclei with no cytoplasmic outlines

There were 5 cases of malignant hemangioendothelioma. The tumors presented essentially identical histologic pictures The most characteristic feature was capillaries lined by endothelioblasts

Synovial sarcoma was seen in 4 males aged 1¼ 26 The tumors were composed of a synovioblastic element, made up of polygonal or cylindric cells and of tissue reminiscent of fibrosarcoma

Myxosarcoma was observed in 3 males aged 8-46 The tumors were composed predominantly of stellate cells lodged in a mucoid matrix. The nuclei were ovoid hyperchromatic and of variable size Among the rare groups of soft tissue sarcomas of the extremities were malignant granular cell myoblastoma, malignant nonchromaffin paraganglioma and extraskeletal osteogenic sarcoma

Incisional biopsy before institution of specific therapy is obligatory for planning accurate treatment In a soft tissue sarcoma the line of surgical excision must pass at least 3 cm outside the palpable tumor limits at all points

► [Dr Sirsat is to be congratulated on the very careful and thorough manner in which he studied his cases, the adequacy of the material obtained at biopsy and the excellence of the microscopic sections. Only by such methods combined with an accurate history and careful physical

examination can a dependable diagnosis be made. The thoroughness shown by this author in his study and analysis of 146 cases of soft tissue sarcomas of the extremities and trunk is commendable.—Ed.]

Spread of Soft Tissue Sarcomas of Extremities Along Peripheral Nerve Trunks was investigated by John R. Barber, Mark B. Coventry and John R. McDonald[2] (Mayo Clinic and Found.). In 38 of 98 amputated extremities the following evidence of a pathologic relation between sarcomas and peripheral nerves was found: (1) adherence of the nerve to the tumor, 13 cases; (2) displacement of the nerve by the tumor, 4 cases; (3) passage of the nerve through the tumor, 11 cases, and (4) invasion of the nerve by the tumor, 10 cases. Microscopic study revealed that the tumor had infiltrated the epineurium in 7 extremities and had infiltrated the epineurium and spread along the nerve for varying distances in 4 others. The invasion seemed to be confined mainly to the epineural connective tissue; the nerve bundles and perineurium apparently resist invasion.

Symptoms suggestive of a pathologic relation between tumor and nerve (pain, numbness, weakness and palsy, neuritis and paresthesia) had been present in 50 patients, but in only 23 instances was it possible to explain the complaints on the basis of gross and microscopic findings.

Metastatic Thyroid Tissue in Bones as Diagnostic Problem. Follow-up Study of Five Cases (Aberrant Thyroid Tissue IV and Conclusion). Jörgen B. Dalgaard and Per Wetteland[3] (Univ. of Bergen) studied biopsy specimens from epithelial tumors confined to the head or neck and specimens containing thyroid tissue. They encountered 1,300 specimens of thyroid tissue. Including those with thyroglossal anomalies without real aberrant thyroid tissue, the number of aberrant thyroid specimens was 137 from 123 patients. All patients were traced in the follow-up studies.

Women predominated in the group with lateral thyroid metastases and in those with osseous thyroid metastases. Age varied widely. Thyroglossal anomalies were most frequent in the 1st and 2d decades, lateral cervical metastases were often encountered in the 3d, ovarian strumas occurred mostly in the 4th, and distant metastases in the 5th or 6th decades.

(2) J. Bone & Joint Surg. 39-A: 534-540, June, 1957.
(3) Acta chir. scandinav. 112: 18-24, 1956.

The authors believe most papillary thyroid tumors laterally on the neck are metastases from carcinomas in the homolateral thyroid lobe and they advocate hemithyroidectomy with removal of all lateral nodes Postoperative irradiation (x rays or I^{131}) seems useful especially if operation cannot be radical However prognosis is fairly good despite the neoplastic nature of the underlying disease

Aberrant thyroids medially on the neck are thyroglossal anomalies not metastases Radical removal with resection of the hyoid bone gives an excellent prognosis but simple removal is often followed by recurrence even after cord dissection Malignancy in thyroglossal vestiges may rarely occur but even then prognosis is not bad

Thyroid tissue in the ovary (struma ovarii) is considered a developmental anomaly without a metastatic genesis Thyrotoxicosis ascites Meigs s syndrome and malignancy may occur The possibility of ovarian struma should be considered in thyrotoxic women without signs of thyroid gland disease. Treatment is simple removal of the growth and prognosis good

Thyroid tissue outside the neck and the ovary is infrequently encountered in biopsy material The osseous system is most often affected Diagnostic biopsy specimens obtained from bones (humerus femur sternum vertebra) and scalps of 5 women revealed thyroid tissue with or without histologic atypia Two patients had spontaneous fractures. The biopsies afforded the first verification of malignant thyroid disease in 3 the diagnosis was unexpected Four died of malignant thyroid disease 3 in 2½ years 1 in whom the primary tumor was a papillary ovarian struma after 17 years One patient with a metastasizing Hurthle cell carcinoma responded to x ray treatment. Thyroid tissue found outside the neck and the ovary probably always represents metastases from thyroid carcinomas A possibly benign structure ("metastasizing adenoma) in the aberrant node should not be deceiving

The term "metastasizing adenoma has often been used to designate nodes of histologically benign aberrant thyroid tissue The denomination is mostly confined to lesions in bones but has often been used in other instances as to designate lesions located laterally on the neck The term

may be revealing to the pathologist but used uncritically it may be misleading for clinicians in masking the true (malignant metastatic) nature of the lesions considered and should be abandoned

Carcinoma in Skin Sinuses and Bone Following Chronic Osteomyelitis is described by Wood W Lovell Richard E King and Rufus Alldredge[4] Generally carcinoma developing in sinuses of chronic osteomyelitis is of low grade malignancy Its greatest incidence has been in patients over 40 Among 500 patients with chronic osteomyelitis over age 40 seen at Charity Hospital New Orleans, from 1928 to 1955 8 (1 6%) had malignant changes With the general use of antibiotics today this complication should become even more rare

There are two varieties of the disease a superficial type that appears as a crater like ulcer and a deep type that arises deep within the tissues and usually is associated with a foul discharge The deep type probably results from epithelization of the tract and bone as shown by Milgram to occur in chronic osteomyelitis The chronic inflammatory process in such a tract probably stimulates neoplastic changes in epithelial cells The carcinoma always is of the epidermoid variety indicating that it comes from the epithelium about the sinus The superficial type probably arises from the chronic irritation from the discharge.

The tibia was involved in 4 of the 8 patients the femur in 2 and the foot in 2 This predilection for the lower extremities can be explained by their relatively poor blood supply also the patients tolerate drainage for longer times in the lower extremities than they would elsewhere

The history is somewhat typical and includes recurrent drainage and pain from a site of chronic osteomyelitis in the lower extremities There may be the typical rolled cauliflower margin about a sinus but this is not necessary Occasionally there is increase in pain and a bloody tinge to the exudate is present

Diagnosis is made by biopsy The specimen should be wide and should include bone If no outward evidence of carcinoma exists it may be found only after the osteomyelitic cavity is explored It is better to rely on the character

(4) South. M J 50 266-271 February 1957

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(4) South M J 50 266-271 February 1957

acute suppurative arthritis before considering a diagnosis of nonspecific inflammatory reaction

If there is strong clinical and laboratory evidence of joint suppuration incision and drainage are undertaken without waiting for bacteriologic proof of the diagnosis Usually one or two broad spectrum antibiotics are given systemically until sensitivity tests of the cultured exudate are completed The results in this series were consistently related to the interval between onset of symptoms and diagnosis and specific treatment. Although the number of cases which were diagnosed early is too small for conclusive evaluation the uniform excellence of the results after incision and drainage favors this treatment as the more certain method of preventing permanent damage to the joint The greater frequency of pathologic dislocations in hips treated by aspiration and the instillation of antibiotics supports this conclusion

Simultaneous Occurrence of Rheumatoid Arthritis and Agammaglobulinemia is discussed by Robert A Good Jerome Rotstein and William F Mazzitello[6] Agammaglobulinemia occurs in two forms One is found only in boys and appears to be the result of an inborn error of metabolism transmitted as a sex linked recessive trait In the other the dysmetabolism of gamma globulin appears to be acquired beginning in either sex at any age Clinically both diseases are typified by repeated bacterial infections Bacterial respiratory infections meningitis septicemia and bacterial infections of the urinary tract skin and bowel have been particularly troublesome in these patients Arthritic manifestatoins are also a common clinical feature of patients with agammaglobulinemia Though in some reported cases these manifestations could not be distinguished from those of classic rheumatoid arthritis in others a diagnosis of idiopathic tenosynovitis was made and in still others the arthritic manifestations although not due to septic involvement of the joint, appeared clinically to be associated with occurrence of a septic process. In 2 of the authors patients who had acquired agammaglobulinemia its clinical onset preceded that of arthritis

Arthritis appears to occur with inordinate frequency in

(6) J Lab. & Clin. Med. 49 343 357 March, 1957

Acute Suppurative Arthritis Melvin B Watkins Robert L Samilson and Daniel M Winters[5] present a statistical analysis of 51 cases seen since 1934 at New York Orthopaedic Hospital There were 30 males and 21 females Ages ranged from a few weeks to 71 years Thirteen were under age 1 year and 9 were aged 1-6 Thus 43% of the acute suppurative joints were found in children under age 7 The knee was involved in 19 cases (37%) and the hip in 18 (35%)

Of the organisms isolated from the aspirated joint fluid, Staphylococcus aureus was found in 35% of the cases and streptococcus in 24% The organisms were introduced into the joint by direct puncture in 7 cases Four cases resulted from children kneeling on sewing needles Hematogenous spread from a distant focus of infection was thought to be the cause of joint suppuration in 44 cases In 19 a definite pre existing infection was demonstrated In children this usually was an upper respiratory infection In several adults acute suppurative arthritis developed shortly after cystoscopy

Diagnosis of acute suppurative arthritis in its early phase is often difficult The usual clinical signs of marked muscle spasm with restriction of motion increased local temperature and severe systemic reaction may be masked by the use of nonspecific antibiotics before diagnostic aspiration. X ray examination may be of little help in the early stages of the disease though occasionally capsular distention may be revealed by the soft tissue shadows The findings of leukocytosis with a shift toward immature types and of an elevated erythrocyte sedimention rate are of considerable significance In every case in this series diagnosis was established by joint aspiration and demonstration of pathogenic organisms in the smears and cultures obtained from the aspirated material The consequences of delay in diagnosis of an acutely infected joint may be disastrous and in doubtful cases the clinician should eliminate a diagnosis of

(5) J Bone & Joint Surg 38-A 1313-1320 December 1956.

Polyarteritis Nodosa Associated with Rheumatoid Arthritis Report of Case with Comments Relative to Concept of Rheumatoid Heart Disease is presented by Edwin R. Fisher[8] (Univ of Pittsburgh) Using active valvulitis the presence of Aschoff bodies or mitral stenosis as criteria for frank rheumatic heart disease Sokoloff found an incidence of only 5.7% in 105 patients with rheumatoid arthritis Recently several authors have re-emphasized the systemic nature of rheumatoid arthritis and have ascribed some specificity to its morphologic manifestations Arteritis different from other forms of necrotizing angiitis has been noted in the heart as well as in other tissues that are frequently affected in this disease Necrotizing granulomas similar to or even identical with those observed in the subcutaneous tissues have been observed in similar sites and in the lungs pleurae peritoneum kidneys and meninges The vascular and granulomatous lesions have been thought to cause many of the cardiac pathologic changes previously interpreted as rheumatic heart disease particularly in the absence of clinical features of the latter Such observations have led to the concept of a specific type of rheumatoid heart disease.

It has also been said that patients with rheumatoid arthritis have a predilection for the development of polyarteritis nodosa. The author examined tissues from a man 57 who had classic rheumatoid arthritis for 15 years and autopsy revealed polyarteritis nodosa was also present Necrotizing granulomas in the walls and adventitia of the affected coronary vessels constituted a unique feature of the vascular disease and the lesions superficially resembled those in the subcutaneous tissues in rheumatic diseases Nodular deformity of the mitral valve was also present The clinical features manifested by this patient reflected the effects of the lesions in the viscera In this respect the disease in this patient was similar to that described by Bevans and her associates as malignant rheumatoid disease

The interpretation that the vascular and cardiac lesions in this patient with rheumatoid arthritis represent polyarteritis nodosa does not refute the existence of lesions

(8) Am. J Clin. Path. 27 191 204 February 1957

patients with both congenital and acquired agammaglobulinemia and in many instances cannot be shown to have a basis in direct infection of the joints. The clinical and laboratory findings of rheumatoid arthritis in 3 of the authors' patients with agammaglobulinemia and in 5 among 58 patients reported in the literature cast doubt on the concept that rheumatoid arthritis results from an immunologic response. The observations also negate the view that this disease is caused by excessive amounts of or qualitatively abnormal gamma globulin in the serum of patients with rheumatoid disease.

Morton's Metatarsalgia in Rheumatoid Arthritis. Kauko Vainio and V. Ritama[7] studied 8 patients with Morton's metatarsalgia, of whom 7 also had symptoms and signs of rheumatoid arthritis. Four of the resected neuromas showed histologic features indicative of rheumatoid nodules. Since the neuroma morphologically characteristic and associated with symptoms and signs of Morton's metatarsalgia occasionally consists of a rheumatoid nodule, perhaps a low grade inflammatory process (characterized less by cell exudation than by proliferation and degeneration of mesenchymal derivatives and alterations of the ground substance) accounts for the development of these neuromas in general. Such a process involving collagenous tissues would lead to degeneration and sclerosis of pre-existing structures. Most writers concur in this view with respect to the nerve lesions. However, the nerve lesions seem to parallel the changes occurring in the larger arteries and veins. In the present series, these vascular changes were bizarre and uncharacteristic of any type of defined vasculitis, whereas they appeared similar to those changes occasionally seen in the periphery of rheumatoid nodules and of other nonspecific expansive processes.

Processes of this kind, including those leading to the appearance of rheumatoid nodules, usually involve many structures even in early stages. The initial stages in the development of the process remain largely unknown. It is assumed that Morton's metatarsalgia occasionally develops as a local manifestation of a generalized disease.

(7) Ann. chir. et gynaec. Fenniae 45: 197-206, 1956.

bility alternate with periods of stimulation associated with a restless drive and relatively little aching During periods of relative well being the patient is alert co-operative and active When depressed he may be unable to concentrate normally and co-operation and activity are restricted Spontaneous crying spells occur Successive increases of dosage accentuate the cyclic swings and may complicate the course

These mesenchymal reactions to chronic hypercortisonism must be differentiated from flares of rheumatoid arthritis due to inadequate dosage of steroids or to abuse of previously damaged joints In chronic hypercortisonism synovitis is minimal or not increased A rheumatoid flare affects joints and fibrous tissue but the musculoskeletal symptoms of hypercortisonism are more diffuse and generalized more in muscles than joints and fibrous tissue and are associated with cutaneous and subcutaneous hypersensitivity and hyperalgesia.

Rest may make the patient with rheumatoid arthritis temporarily worse but may benefit the patient with rheumatism and chronic hypercortisonism in whom aching is cyclically related to fatigue Physical therapy or salicylates help patients with a rheumatoid flareup but do not adequately relieve the symptoms of chronic hormone overdosage Sedimentation rate is of no help in differentiating the two problems Remarks by the patient that arthritis is getting worse" or coming back require careful analysis Detailed observations are needed to permit accurate decision to lower or temporarily raise the dose of hormones

Massive Gastrointestinal Hemorrhage during Prednisteroid Therapy for Rheumatoid Arthritis was observed by Selvan Davison[1] (Mount Sinai Hosp New York) in 1 man 65 and 1 woman 37 In the former a duodenal ulcer developed under observation and on a strict ulcer regimen and in the latter a gastric ulcer appeared. Each patient had a massive acute hemorrhage and emergency subtotal gastrectomy was performed as a lifesaving procedure. The man is a hopeless cripple without some form of steroid and under such a circumstance cortisone or hydrocortisone will probably be used as a necessary and calculated risk The woman despite admitted greater relief from steroids can carry on

(1) New York J Med. 57 1758-1760 May 15 1957

that possibly represent a specific type of rheumatoid heart disease But it does indicate other entities may cause such histopathologic changes in patients with this disease. The association of rheumatoid arthritis with rheumatic heart disease re emphasizes the similarities between the former and other diseases characterized by disseminated vascular lesions necrosis of collagen and manifestations in the joints, and cardiac lesions that may have a common pathogenic factor notably hypersensitivity The term malignant rheumatoid arthritis appropriately designates the nature of the clinical features shown in this case However such a term has little value from a pathologic standpoint since it implies the occurrence of lesions peculiar to rheumatoid arthritis and negates the possibility that such manifestations may be due to other pathologic entities There is no unequivocal evidence that steroid therapy causes such visceral manifestations in patients with rheumatoid arthritis

Diagnosis Treatment and Prevention of Chronic Hypercortisonism in Patients with Rheumatoid Arthritis. The term hypercortisonism encompasses both the direct and the indirect effect of adrenocortical hormones or ACTH The syndrome is delineated by Charles H Slocumb Howard F Polley L Emmerson Ward and Philip S Hench[9] (Mayo Clinic and Found) Acute hypercortisonism almost always develops during use of large doses of steroids Signs develop quickly and commonly include excessive appetite and weight gain euphoria insomnia increased nervous tension and irritability facial rounding increase of fat pads fluid retention, edema irregular menses acne and hypertrichosis Acute hypercortisonism should be tolerated only if the disease being treated is so serious that further hormone treatment is imperative or if the treatment period is to be short

Chronic hypercortisonism results from prolonged over dosage with cortisone or related preparations even though overdosage is mild and unsuspected It usually develops insidiously over weeks or months the degree and rate varying with the amount of hormone duration of administration and age and sex of the patient The characteristic feature is cyclic swings of mood and symptoms Increased fatigability muscular and joint aching and emotional insta

(9) Ann. I t. Med. 46 6 101 January 195

a connection between the skin and joint manifestations as evidenced by the simultaneous onset and exacerbations (4) The arthritis was less often polyarticular at onset than classic rheumatoid arthritis (5) Distal interphalangeal joint involvement was related topographically to the nail rather than to the skin lesions (6) Stiffness played a major part in the symptomatology (7) Complete remissions of the arthritis occurred frequently (8) Generally the disease was milder than rheumatoid arthritis as shown by fewer joints involved clinically and radiographically a smaller incidence of ulnar deviation and milder stigmas in the originally affected joints However a mutilating type occurs rarely (9) The disease was either very mild or crippling (10) A similarity to gout was noted at some time in the history in 39% of the patients (11) When the distal interphalangeal joints and nails were involved the finger tips appeared spadelike. (12) There was family history of psoriasis in 35% (13) A high incidence of ankylosing spondylitis was seen (14) Nodules and tendon sheath effusions were absent except in 1 patient with a positive DAT (15) The incidence in males was slightly increased (16) There was apparently less anemia a lower erythrocyte sedimention rate and less tendency to leukocytosis which was probably due to selection of the patients

In the present series some of the findings differed from those of previous authors In most patients the psoriasis was not extensive or pustular nor did it affect the palms and soles when the skin eruption was extensive the arthritis was severe Alleviation of the skin condition seemed to help the arthritis in only 1 instance and the significance of the association was dubious since the patient was in the hospital at the time The patients were not unusually susceptible to toxic gold reactions Thickening not pitting was the commonest nail change In none was arthritis limited to the distal interphalangeal joints and it was not unduly resistant to treatment Serum protein levels were abnormal in several patients

Reticulohistiocytosis (Lipoid Dermatoarthritis) was observed by Robert P Warin Clifford D Evans Mark Hewitt A L. Taylor C H G Price and J H Middlemiss[3] in 4

(3) Brit. M. J 1 1387 1391 June 15 1957

adequately with alternative treatment Steroids should not have been used originally and their consequences should have been avoided Further the maintenance dose of 20 mg prednisone was too high

From the corticosteroids to the prednisteroids the salt retention properties diminish and the anti inflammatory powers increase This explains the greater antirheumatic action of the latter and at present they are used almost exclusively Simultaneously more gastrointestinal disorders have appeared and it is a question whether the more frequent development of peptic ulcer may derive from the undesirable poor tissue healing effect which is concomitant with the desirable antirheumatic action It has been suggested that an ulcer regimen used in conjunction with steroid drugs might prevent formation of peptic ulcers Recent investigations cast doubt on such assumptions

Psoriasis and Arthritis V Wright[2] (Leeds England) compared 42 patients with psoriasis and arthritis (34 with erosive arthritis 6 with degenerative joint disease 1 with gout and 1 with rheumatic fever) with 55 unselected patients with rheumatoid arthritis and a positive differential agglutination test (DAT) and 310 patients with psoriasis alone. Besides clinical comparisons the following tests were done hemoglobin estimation erythrocyte sedimentation rate (Wintrobe) white cell count serum proteins Kunkel's zinc sulfate electrophoresis serum alkaline phosphatase serum cholesterol C reactive protein and DAT

The author concluded that the patients with osteoarthritis, gout and rheumatic fever were examples of a chance association although surprisingly all 4 men with osteoarthritis had nail changes On the basis of the DAT 2 of the group with erosive arthritis were thought to have rheumatoid arthritis and coincidental psoriasis whereas in the rest the disease probably formed a distinct entity

The group with erosive arthritis presented some significant features (1) There was a high incidence of changes in the nails (87%) the latter being the sites of onset in 16% The nails only were affected in 2 patients (2) The nail changes bore a closer relation to the onset and course of the arthritis than the skin lesions (3) A few (13%) showed

(2) Ann Rheumat Dis 15 348 356, December 1956.

In all the histologic picture was dominated by a varying number of the same type of unusual large cell Apart from the aggregations in the skin and the synovia similar isolated cells were shown in the marrow lymph nodes endocardium voluntary muscle and periosteum and scattered through the subcutaneous tissues On morphologic grounds it seems likely these abnormal cells were neoplastic Transitional cells between fibrocytes and the giant cells suggest the latter were derived from the fibrocytes of the skin the synovial membrane and elsewhere The cytoplasm of the giant cells did not show the usual staining reactions of lipid and it is suggested the material may be a polypeptide-lipid complex. The fact that this material was shown in small amounts in cells in a relatively isolated position argues strongly in favor of an intracellular origin rather than histiocytic phagocytosis (Fig 62)

Renal Function in Gout With Commentary on Renal Regulation of Urate Excretion and Role of Kidney in Pathogenesis of Gout. Alexander B Gutman and T sai Fan Yü[4] (Mount Sinai Hosp New York) studied renal function in 300 gouty patients Standard renal clearance technics were used in about 160 including some asymptomatic hyperuricemic relatives of the patients

C_{In} C_{PAH} and Tm_{PAH} were generally consonant with the values found in normal persons of equivalent age but impairment of renal hemodynamics was not infrequent particularly in those of advanced age or with overt renal disease.

Determinations of urinary urate excretion whether measured as UV_{urat} in short clearance experiments or in 24-hour urine collections gave values within the normal range in most cases In a significant minority however the excretion was unequivocally in excess of the limits of normal variation

The filtered urate load was increased in most gouty patients The presumptive tubular reabsorption of urate was correspondingly increased but so far as could be determined not disproportionately so in relation to the percentage of urate reabsorbed by the tubules at equivalent filtered urate loads in normal persons

(4) Am. J Med. 23:600-622 October 1957

The results indicate essentially normal discrete renal functions in most gouty patients With advancing years and disease the glomerular filtration rate progressively declines and some tubules apparently deteriorate Secondary renal retention of urate then becomes apparent.

The data fail to disclose any primary defect in tubular function specifically of abnormally enhanced tubular reabsorption of urate Contrarily the clearance data imply overproduction of urate in gout This interpretation is supported by reference to metabolic data

The available clearance data are not incompatible with the view that the filtered urate load assuming complete filtrability of plasma urate, normally is wholly or largely reabsorbed by the tubules and that the excreted urate derives entirely or chiefly from tubular secretion

The pathogenesis of hyperuricemia and other manifestations of gout cannot be ascribed to any hypothetic primary renal defect, whether of abnormally great tubular reabsorption or deficient tubular secretion of urate

Diphenylamine Reaction in Chronic Joint Diseases was studied by Milan Adam Jiri Malecek and Marta Kůtová with statistical collaboration by Vladimir Malý[5] (Prague) Protein free precipitate of plasma or serum heated in a boiling water bath with Disches diphenylamine reagent gives a dark purple color in certain diseases especially in malignancy and inflammatory diseases such as rheumatoid arthritis rheumatic fever subacute bacterial endocarditis *empyema and tuberculosis The value of this* diphenylamine reaction as an index of rheumatic fever activity has been attested in several reports

The authors analyzed diphenylamine levels in chronic joint diseases and correlated them with the nonglucosamine serum polysaccharide and mucoprotein levels to elucidate the relation between these three reactions Serums of 250 subjects were examined The diphenylamine color reaction was ascertained by the modified Ayala method the non glucosamine serum polysaccharides by the Shetlar method and the mucoproteins by the Winzler method.

The difference between the mean diphenylamine reaction in second stage rheumatoid arthritis and in degenerative

joint disease and ankylosing spondylitis was highly significant The difference in the erythrocyte sedimentation rate was not significant Correlation between the diphenylamine reaction levels and nonglucosamine serum polysaccharide levels was significant at a level of 0 1% in all groups of patients

Hence the substance which gives the purple color is thought to be related rather to the nonglucosamine serum polysaccharides than to mucoprotein It is felt the diphenyl amine reaction may be used as a measure of the degree of inflammation not only in rheumatic fever but also in rheumatoid arthritis and in ankylosing spondylitis

Age Factor and High Fat Diets in Evolution of Osteoarthritis in Mice was studied by Martin Silberberg and Ruth Silberberg[6] (Washington Univ) In male mice of strain C57BL the feeding of a diet enriched with 25% lard increased the incidence and accelerated the progress of degenerative joint disease as compared to conditions in stock fed control animals The harmful effect of the high fat ration on the articular structures was still noted if the diet was given for a limited period only Though damage to the joints was less marked than after prolonged consumption of the fat-enriched ration the evolution of the articular lesions was accelerated

The high fat diet apparently acts so as to cause a prompt response of the susceptible cartilage leading to rapid appearance of the joint lesions Low grade lesions apparently may remain stationary for a considerable period without progressing to an advanced stage Whether they increase in severity and incidence depends on such factors as age at the time the dietary regimen is instituted and duration of feeding Young articulations exposed to a high fat diet showed greater injury than aged joints and in animals of all age groups prolonged exposure was more injurious than brief exposure.

Old mice gained less weight on the high fat diet than young mice Therefore utilization of ingested fat probably varied with the age of the animal tested and the decreased articular response may thus partly be related to the age change in metabolism However the decreased effectiveness

(6) J Gerontol. 12:9 13 January 1957

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of the fat enriched ration in old animals may also be due age changes in the cartilage itself which loses its reactiv to growth promoting stimuli with advancing age In mice strain C57BL this change becomes apparent sometime du ing the second half of the first year of life Onset of tl phase may vary from strain to strain and from species species In growing dogs regeneration of injured cartila did not differ from that observed after epiphysial closu Yet at the latter stage the reactivity of the cartilage m be different from that of late adulthood or senescence Ho ever the growth response of the articular cartilage acromegalics decreases considerably with advancing a as did that of mice and guinea pigs treated with anter hypophysial hormones

Value of Irradiation in Ankylosing Spondylitis was studi by N Howard[7] (Univ College Hosp London) in 455 p tients followed for over 2 years Localized x ray thera was used with roughly the same technic in each patie 220 kv 2 3 mm Cu half value layer 50 cm focus skin d tance 1 field to cover both sacroiliac joints 16 × 12 cm 10 × 15 cm and 3 spinal fields 6 × 15 cm or 6 × 20 cı according to the length of the spine. Two fields were treat daily to 150 or 200 r skin dose 5 days/week for 3 or weeks with total skin dose not over 1 500 r to the wh spine.

Of 100 patients chosen at random only 18% had lc white blood cell counts (below 4 000/cu mm) during immediately after treatment. Among 20 women aged 20– menstruation continued unaltered in only 5 Irradiation the sacroiliac or hip joints in women should therefore undertaken only when the disease is incapacitating a when other methods of treatment have failed

There were 198 relapses (43%) often some years aft the original treatment. With the improved results obtain later by retreatment 345 patients obtained good result 77 moderate and 33 no results Follow up x ray studies the spine and sacroiliac joints were done in 81 patients showed no further change after radiotherapy and only showed advance of the disease.

(7) Brit. J Radiol 30 3 1 3 4 July 1957

In this series the risk of leukemia was 1 in 225 instead of 1 in 2000 as in the general population in 10 years

Osteoarthritis and Spondylosis of Spine were studied by Bernard S Epstein and Joseph A Epstein[8] (Long Island Jewish Hosp New Hyde Park N Y) True osteoarthritis of the spine is an inflammatory disease involving the apophysial joints these are the only joints of the spine lined with synovial membrane This condition is still not completely understood

The common term osteoarthritis of the spine is better referred to as spondylosis or spondylosis ossificans This disease originates as a degenerative lesion of the intervertebral disks associated with bony reaction in the adjacent vertebral periosteum and ligaments When such changes occur in the lateral and anterior aspects of the vertebral column they may or may not be associated with a wide variety of complaints These lesions also may produce changes referable to the posterior aspects of the intervertebral disks and cause pressure against the spinal cord the cauda equina or the contents of the intervertebral foramens depending on the position and extent of the pathologic process

When the lesions are large and centrally placed a tumor may be simulated With more diffuse involvement various degenerative diseases of the spinal cord may be mimicked Laterally situated lesions may simulate herniations of the intervertebral disk.

Hyaluronic Acid in Heberden s Nodes D S Jackson and J H Kellgren[9] (Univ of Manchester) analyzed the gelatinous fluid from the Heberden nodes of 4 patients with *generalized osteoarthritis The fluids were examined for* mucopolysaccharides and proteins by electrophoresis and by chromatography after hydrolysis in strong acid. Samples were incubated with testicular and bacterial hyaluronidase In 2 instances the mucopolysaccharide was isolated with the use of cetyl pyridinium chloride and subjected to analysis

It is suggested that the fluid from Heberden s nodes con

(8) Rheumatism 13.82-87 October, 1957
(9) Ann. Rheumat. Dis. 16.238-240 June, 1957

tains only hyaluronic acid free from protein or peptide This is in contrast to the findings in synovial fluid from a patient with generalized osteoarthritis which contained considerable serum type proteins

The significance of this local accumulation of hyaluronic acid is not yet clear but presumably it is related in some way to the peculiar painful state noted in acute Heberden nodes It also may play a part in the bony hyperplasia that *is such a feature of this form of osteoarthritis*

Response by Antibodies to Tissue Antigens in Course of Rheumatic Fever was investigated by V Wagner and V Rejholec with a statistical evaluation by V Maly and the technical assistance of A Sovakova M Motlikova and E Hallerova[1] The collodion agglutination method was applied to investigate antiorgan antibodies to antigens from human myocardium valves subcutaneous tissue skin and joint capsule The examinations were carried out with serums from 38 patients with rheumatic fever The serologic results were compared with the results of other laboratory and clinical examinations The greatest attention was paid to the correlation of antibody with damage to the myocardium and valves

Antibody was found at least once in the blood of each patient but the incidence of antibodies to single antigens ranged from 70.2% (to joint capsule antigen) to 97 4% (to subcutaneous tissue antigen) During the first week of hospitalization 80.7% of patients were found to have antibody to at least one type of antigen in the blood

The findings of antiorgan antibodies were compared with the therapy received before hospitalization Patients who had been inadequately treated or untreated showed a higher incidence and higher levels of antibody The interdependence between antibody findings and signs of heart damage was statistically significant whether all five types of antibody or only the antimyocardial and antivalvular types were considered Reinfection during the disease caused a statistically significant rise in titer A parallel was seen between the antibody concentration and the activity of the rheumatoid process as measured by the erythrocyte sedimentation

(1) Ann. Rheumat Dis. 15 364-372 December 1956.

rate and Weltman reaction No antibody was found in a control group of healthy subjects

Isolation of Species of Genus Herrellea from Patient with Chronic Synovitis is reported by James Ino and Donald L Neugebauer[2] (Fitzsimons Army Hosp)

Man, 27 was hospitalized for difficulty in moving and soreness of the left knee. The symptoms were first noted about 7 years before when a mass was palpable in the popliteal space. Operation was performed, but the findings are not known. About 2 years later another operation was performed on the same knee and a questionable diagnosis of Baker's cyst was made The patient had no further difficulty with the joint for several months but soreness finally developed again.

Physical examination at the time of hospitalization revealed scars of the skin of the left popliteal region a nontender rather firm, poorly circumscribed fulness in the left popliteal region virtually a full range of motion in the left knee but an audible "snap" when the leg was flexed on the thigh and no evidence of relaxation of the ligaments of the contiguous muscles. The white blood cell count was elevated.

Fluid was aspirated from the knee. A few days later a piece of synovial membrane was removed for biopsy and histologic study revealed the changes of chronic synovitis The knee became painful and swollen. Treatment consisted of bed rest and appropriate physical therapy From the synovial fluid pleomorphic, encapsulated gram negative small rods were isolated. The organisms grew well on blood agar eosin-methylene blue agar and MacConkey's agar Most biochemical tests were negative, but the organism produced acid (no gas) from dextrose and xylose, and citrate was used for growth. Serologic studies with specific antiserums indicated the organism was a strain of Herrellea, sp 101

Changing Picture of Juvenile Rheumatism as seen at the Great Ormond Street Hospital from 1869 to 1950 is reviewed by P J N Cox and B E Schlesinger[3] The incidence of the disease relative to the total medical admissions remained fairly constant at about 10-15% during 1869 1920 Only during the last 30 years has a rapid decline occurred The immediate mortality rate was constant at about 8% up to 1920 in 1949 and 1950 there were no deaths apart from 1 which occurred after transfer to another hospital The incidence of carditis relative to the total number of patients hospitalized for rheumatism has been fairly constant at about 60% the incidence of chorea was also unchanged at

(2) Am. J Clin. Path. 26 1486-1489, December, 1956.
(3) Great Ormond St. J 11 38-48 Summer 1956.

about 60% until 1920 but in 1946-50 it was 39% In 1946-50, the number of rheumatic fever patients without evidence of carditis or chorea increased In patients with carditis congestive failure and mortality have decreased in the last 30 years The general incidence of rheumatic nodules has shown little change

The age incidence has remained substantially unchanged although in 1946-50 there was a slight increase in the proportion of patients aged 2-6 and a peak incidence at 10-12 years in place of the previous even distribution over the years 6-12 Children over age 12 are not usually admitted to the hospital During the whole study period there has been a fairly steady flow of admissions throughout the year with no seasonal predominance

The streptococcic etiology of acute rheumatism is no longer in doubt though the exact nature of the hypersensitivity reaction which leads to the disease in only a small *proportion of those infected with hemolytic streptococcus* remains unknown The decline in incidence of rheumatic fever over the last 30 years has not been accompanied by any great advance in treatment If the crippling effects of rheumatic heart disease are to be abolished further preventive measures are necessary The decline can be attributed to the effect of improved social conditions on the epidemiology of streptococcic infection and to chemotherapy

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FRACTURES DISLOCATIONS AND SPRAINS

Fractures of Facial Bones A statistical report on 615 fractures of the facial bones treated on the plastic and maxillofacial surgery service at Kings County Hospital during 1950-54 is presented by Richard H Walden Paul R. Wohlgemuth and John H Fitz Gibbon[4] These figures are compared with those on 212 cases seen at the same hospital during an 18-month period in 1943-44

In the more complicated cases there has been a marked change in the methods of therapy in the past decade Antibiotics have made practicable a simple surgical approach

(4) Am. J S rg 92 915 919 December 1956.

for cases in which simple interdental wiring alone will not suffice Gunning splints Major appliances Kingsley splints and other measures used for external reduction and immobilization of fractures have not been used during the past 5 years.

In 1943-44 surgical methods were used to reduce and immobilize fractures in only 10% of patients In the past 5 years 210 patients (34% of the total) have had some type of surgical intervention Of these 37 patients (6% of the total) required multiple procedures at one operation Though 101 patients (22% of all mandibular fractures) had direct bone wiring of the fracture this procedure was used in only 1% of patients in 1943-44

Only 1 condylectomy was performed in this series The authors believe unilateral fractured condyles should be left alone unless signs of major disability such as impaired function due to an impacted condyle or developing ankylosis are present at which time the condyle can be extirpated In bilateral condylar fractures an attempt is made to wire the condyle in position on one side Bilateral wiring of the condyles is rarely done

In treatment of fractures of the malar compound when the infraorbital ridge is involved and there is depression or posterior displacement of the body of the malar bone an intraoral approach through a Caldwell Luc incision over the cuspid area is used For fractures of the zygomatic arch the Gillies approach is used

In complicated multiple fractures of the facial bones therapy is based on the principle of building on a solid foundation The nearest solid bony structure cephalad to the fracture site is used for support The authors believe that external skeletal fixation methods give much less accurate reductions than available open surgical methods

A great reduction in infections in patients with mandibular fractures has occurred in the past decade due to routine use of antibiotics In the present series of 466 patients 30 (6%) acquired osteomyelitis and 24 (5%) had soft tissue infection In 1943-44 osteomyelitis developed in 31% of patients and soft tissue infections in 16% The infections encountered in the present series were not as severe as those encountered previously The incidence of infection of bone

within a few days of cord damage sustained at the time of injury Anatomic reduction was achieved or maintained in 21 patients, in 13 by skull traction and in 7 by halter traction Incomplete reductions but stable relations were achieved or maintained in 10 Despite external fixation there was recurrence in 4 patients Spontaneous fusion occurred between adjacent injured vertebral bodies in 8 No patient had local or referred pain once the injury had healed There was a complete range of cervical motion consistent with age in all patients who survived the injury Cord injury during treatment occurred in 2 patients Twenty two patients returned to work in an average of 9 months

Unusual Sequela Following Pinning of Medial Clavicular Fracture. Victor Kremens and Frank Glauser[6] (Albert Ein



Fig 63 —Postanterior x-ray after insertion of 2 Steinmann pins across medial clavicular fracture site at open operation. (Courtesy of Kremens, V., and Glauser F : Am. J Roentgenol. 76 1066-1069 December 1956.)

stein Med Center Philadelphia) report a case in which one of two short Steinmann pins inserted at open operation across fragments of a fracture in the medial portion of the left clavicle (Fig 63) was expectorated by the patient about a month after insertion The pin had migrated from its original site into the soft tissues at the foot of the neck and then into the trachea It was delivered spontaneously after a single spasmodic spell of coughing

(6) Am J Roentgenol. 76:1066-1069 December 1956.

Introduction of a metallic wire or pin into the medial portion of the clavicle for fixation of fracture fragments constitutes a potentially hazardous procedure Treatment of fractures in this area would perhaps best be handled differently Such treatment for fractures of the middle or distal portions of the clavicle offers less possibility of complication but should not be considered an innocuous procedure One of the best safeguards against untoward results is frequent roentgen examination before, during and after operative intervention with internal fixation

Traumatic Posterior Luxations of Shoulder R Peycelon P Replumaz and C R Michel[7] discuss 5 cases observed personally and 62 reported by others since 1941 This injury occurs predominantly in men aged 35-50 and is always caused by direct trauma involving the anteroexternal region of the shoulder or by indirect injury from falling on the elbow or hand with arms in abduction and internal rotation. Abnormal inclination of the glenoid cavity has been postulated as a predisposing cause Posterior luxations are anatomically of two types (1) subacromial which occurred in 4 of the 5 patients studied, and (2) subspinal which exhibits more pronounced displacement and is easier to diagnose

Clinical and radiologic diagnosis of recent luxation of the shoulder is difficult since the symptomatology is not specific and anteroposterior roentgenograms generally do not reveal the nature of the difficulty Two clinical signs are consistent e g intense and persistent pain and fixed position of internal rotation often associated with irreducible adduction

The widespread habit of relying solely on anteroposterior films is responsible for most failures to diagnose early luxations (about 50% of all cases) Profile films are a routine necessity in shoulder injuries In Case 1 (Figs 64 and 65) a posterior luxation of the left shoulder was visible only in the lateral film along with a fracture of the trochiteric mass

Acute and chronic luxations present contrasting treatment indications Recent luxations respond generally to simple reduction by manipulation under anesthesia If fractures

(7) Rev chir orthop 42 630-646, Oct.-Nov., 1956.

are present reduction must be accompanied by immobilization in abduction Among 32 acute luxations there were only 5 failures with this method and all were associated with fractures Four were later reduced by open operation and 1 required resection of the head Two of 3 patients treated by the authors in this way showed excellent results but the third (Case 1) continued to have limitation of abduction and external rotation

Chronic luxations can occasionally (8 of 31 cases) be reduced by manipulation which should always be cautiously attempted In most cases of this type operation is necessary



Fig. 64 (left) —Anteroposterior x-ray before reduction.
Fig 65 (right) —Profile x-ray before reduction.
(Courtesy of Peyceron, R. *et al.*: Rev chir orthop. 42:630-646 Oct. Nov., 1956.)

Reposition by open operation is usually possible The procedure (subscapular transposition posterior acromial abutment or more rarely *closure of capsule and transposition* of rotators of the shoulder) will depend on the surgeon s preference and the individual indications The authors recommend open reposition by the transacromial superior route (Huc s technic) because it yields excellent results and prevents recurrences In the authors 2 surgical cases 1 patient 67 had complete relief from pain no muscular atrophy and perfect mobility with complete abduction and normal strength The second patient was followed only 4 months In 13 of 21 surgical transpositions reported since 1951 results were good or very good

***Migration of Fracture Transfixing Pin from Humerus into* Mediastinum** Significant medial migration of a pin is uncommon Michael Burman Sol Grossman and Stefan Rosenak[8] (New York) report 2 cases In Case 1 intrapelvic migration of a pin from the femur resulted in bladder irritation Case 2 is given here

Woman 85 had a dislocated left shoulder and an oblique fracture of the upper third of the humerus. Four pins were inserted in the



Fig 66.—One of 2 remaining wires migrating medially through axilla. (Courtesy of Burman, M, *et al* Am J Roentgenol 76 1061 1065 December 1956.)

area of the fracture. The pinning was firm enough to allow the arm to move as a unit. The fracture was healed solidly 1 month later The 2 upper wires backtracked and were removed at that time About 6 months later an x ray was taken because of recurrence of pain in the arm (Fig 66) This x ray was not seen until 3 weeks later when the patient began to expectorate blood. At that time a chest x ray revealed that 1 of the 2 remaining humeral wires had moved into the mediastinum. The wire seemed well above the heart, but later fluoroscopic studies revealed the medial end of the wire appeared to move

(8) Am. J Roentgenol 76 1061 1065 December 1956

with the heart. Since stereoscopic x rays indicated the wire lay above and posterior to the heart, it was felt that penetration of the heart by the needle was unlikely Attempted removal of the wire with a magnet attached to the skin was unsuccessful

Bleeding from the lung remained scanty Temperature averaged 100 F and gradually fell to normal about 2 weeks after onset of the hemoptysis After the initial period of irritation the patient showed no ill effect from the mediastinal wire. Digitoxin, antibiotics and sedation were given and she left the hospital 3 months after onset of chest symptoms. Three weeks later she was readmitted in congestive heart failure Death occurred soon thereafter

Injuries about Elbow in Children, with Emphasis on Supracondylar and Monteggia Fractures. The treatment of children with these injuries differs from that of adults Various types of injury and their treatment are discussed by Otho C Hudson A W Lawrence R. T Sweet and H K S Murphy[9] (Hempstead N Y)

Subluxation of the head and the radius occurs in children aged 18 months to 3 years It is caused by sudden extension in supination of the forearm on the arm with traction as in assisting the child onto or off a curb Treatment consists of closed reduction during examination by supination of the forearm pressure over the head of the radius and flexion of the elbow

Because of growth factors in children the head of the radius should not be removed in fractures of the head or neck of the radius Examination shows pronation of the forearm loss of elbow function tenderness over the head of the radius and joint distention X rays reveal the lesion and angulation of the fracture which may be of the greenstick type. Closed reduction may be attempted If it is unsuccessful open reduction is indicated The head fragment is maintained in reduction by complete pronation of the forearm

Fracture of the olecranon may be incomplete or nondisplaced and should be immobilized in plaster for 6 weeks Fracture with displacement is treated by open reduction and immobilization

Fracture of the capitellum is usually displaced with rotation of the fragment If the fragment is not displaced immobilization is used If the fragment is displaced an open op-

(9) J Internat. Coll. Surgeons 28:332-337 September 1957

eration is necessary to replace and derotate it Fixation is by suture or Kirschner wire Plaster immobilization is used for 8 weeks

For fracture of the medial epicondyle the ulnar nerve should be transplanted anteriorly and the fragment of bone excised

Fractures of the supracondylar area of the humerus should be immobilized in a shoulder spica Circulatory interference to the hand after a supracondylar fracture of the humerus demands open operation This is preferable to repeated attempts at closed reduction

In Monteggia fractures a greenstick fracture of the ulna may be associated with dislocation of the head of the radius. Early treatment by closed reduction can be successful if the head is stable in all positions of motion If it is unstable, open reduction is necessary If the ulnar fracture is of the greenstick type open operation is needed The greenstick fracture must be completed by breaking both cortices to secure reduction of the ulna and dislocation of the head of the radius The ulna is fixed internally by a long intramedullary pin When the orbicular ligament is torn it should be repaired

The end result of treatment of all elbow fractures in children is better than that obtained with the same fractures in adults

Medullary Fixation of Forearm Fractures Hugh Smith and Fred P Sage[1] (Campbell Found Memphis Tenn) state that benefits and advantages of medullary fixation are not as apparent in treatment of forearm fractures as in treatment of femoral fractures This conclusion is based on a study of 338 patients with 555 fractures the data for which was accumulated from 17 sources Most of the participating members in this study had taken part in a previous similar study on the femur and therefore were thoroughly acquainted with the principles of medullary fixation The most important contribution of this method to treatment of forearm fractures is perhaps that it maintains length and alinement with a minimal incidence of infection in the presence of severe soft tissue injury

In the treatment of solitary or segmental fractures of the

(1) J Bone & Joint Surg 39 A 91 98 January 1957

ulna the medullary fixation method is efficient rapid and simple In radial fractures however the technic is neither simple nor uniformly efficient When both bones are fractured use of a supple small medullary pin in the radius may have an adverse effect on the ulnar fracture even though the latter is securely fixed because with collapse of the radial arch there is relative elongation of the radius and subsequent distraction of the ulnar fracture As a consequence nonunion often results in both bones (Fig 67)

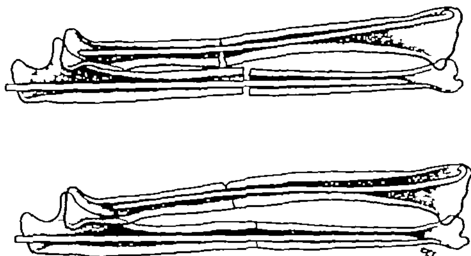


Fig. 67 —When medullary pins are used in both bones, fixation of radius must be sufficiently stable to prevent collapse of radial arch; otherwise, relative elongation of radius occurs with distraction of ulnar fracture. Thus, nonunion may result in either or both bones. (Courtesy of Smith, H., and Sage, F P J Bone & Joint Surg. 39 A 91-98, January 1957)

Since this article was written 100 radii have been studied with particular reference to the anatomy of the medulla On the basis of the anatomic data obtained one of the authors (F P S) designed a triangular nail of proper malleability with pre bent curves that closely simulate the normal arc of the medulla In 20 patients in whom this nail was used the technic of insertion and efficiency of fixation of the radius were considerably improved

Fracture of Distal Radial Shaft Mistakes in Management. The high incidence of nonunion delayed union and malunion in closed fractures of the radial shaft at the junction of the middle and distal thirds without an associated fracture of the ulna has not been appreciated. Jack C Hugh

ston[2] (Columbus, Ga.) presents results of a study of this type of fracture made by members of the Piedmont Orthopaedic Society.

Four factors are considered the major causes of deformity after reduction. Figure 68 shows the fracture and the usual resulting deformity. The weight of the hand, even while the arm, wrist and hand are immobilized in a cast (Fig. 69), acts as a strong volar displacing force or pull on the distal radial fragment, resulting in subluxation of the distal radio-

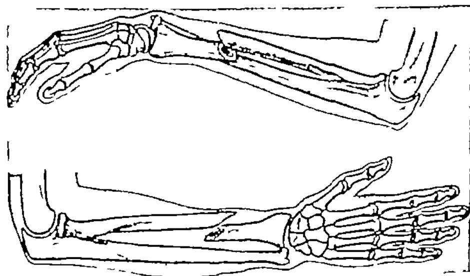
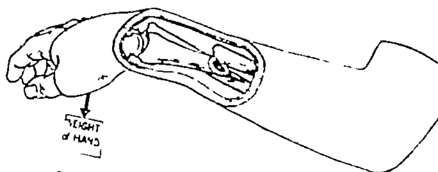
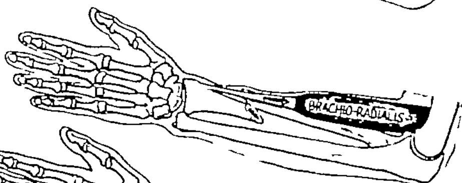


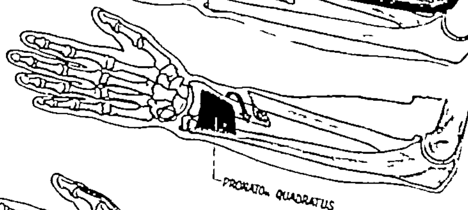
Fig. 68.—Fracture of distal radial shaft and resulting deformity. (Courtesy of Hughston, J. C.: J. Bone & Joint Surg. 39-A:249-264, April, 1957.)

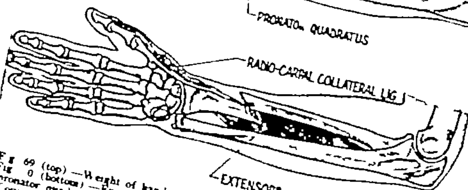
ulnar joint and malalinement at the fracture site. The fracture of the distal radial shaft occurs just proximal to the insertion of the pronator quadratus into the volar surface of the body of the radius (Fig. 70). The strong action of this muscle is often overlooked. The distal radial fragment is rotated toward the ulna and is pulled in a volar and proximal direction by the pronator quadratus. The brachioradialis inserting into the radial styloid process utilizes the ligaments at the distal radioulnar joint as a pivot on which to rotate. At the same time it shortens the distal radial fragment on the ulna. The customary position of the hand for immobilization of the fracture can be considered ulnar deviation. The thumb, in line with the radial shaft, utilizes

(2) J. Bone & Joint Surg. 39-A:249-264, April, 1957.









F g 69 (top) —Weight of hand act a strong volar displacing force.
Fig 0 (bottom) —Fractu f distal radial shaft occurring proximal to insertion f pronator quadratus into olar surface of body of radius
(Courtes of Hughston J C J Bone & Joint Surg. 39-A 249-264 April, 1957)

the radial collateral ligament for traction on the distal portion of the radius The force of the thumb abductors and extensors although not great is enough to shorten the radial side of the wrist and lead to relaxation of the radial collateral ligament

Forty-one selected cases were studied The initial treatment in 38 consisted of closed reduction and immobilization and in 3 of open reduction and internal fixation Criteria of a satisfactory result included union perfect alinement, no loss of length no subluxation of the distal radioulnar joint and no limitation of supination or pronation A result was unsatisfactory when there was one or more of the following nonunion shortening angulation subluxation or dislocation of the distal radioulnar joint and some degree of limitation of supination Conservative treatment of the 38 fractures resulted in failure in 35 (92%) and satisfactory results in the other 3 Open reduction or reconstruction was done in 28 of the 35 cases in 21 operation was done within 4 weeks after fracture with satisfactory results in 14 (67%) and unsatisfactory results in 6 (28%) The result in 1 case is unknown Of 9 cases in which operation was done late (including 2 with unsatisfactory results after the initial operative treatment) results were unsatisfactory in 6 (67%) and satisfactory in 3 (33%)

Fractures of the distal third of the radial shaft are difficult to treat successfully by closed reduction The early treatment of choice is open operation and anatomic reduction with rigid and secure internal fixation Resection of the distal portion of the ulna and bone grafting should be seriously considered in fractures brought to operation 3-4 weeks after fracture Restoration of good function in fractures treated late appears to be accomplished successfully by intramedullary fixation combined with bone grafting of the radius and resection of the distal portion of the ulna.

► [The orthopedic surgeon who believes that treatment of simple fracture of the distal third of the radius is not difficult should read this article carefully Correction of angulation, restoration of length and obtaining union of the fracture may not be enough to give a good result. The surgeon should understand the importance of pronation and supination. He should rotate the distal fragment to correspond with the pronation-supination of the proximal fragment, in addition to restoring length and alinement. That result in 35 of 38 fractures treated by closed methods were not satisfactory is indeed startling We should all re-examine our own cases and see if our results are better —Ed.]

New Method of Pelvic Fixation for severe fractures was used in 4 cases by William Johnson[3] (Galesburg Ill) Comminuted pelvic fractures are becoming increasingly common as a result of automobile accidents, particularly those in which the automobile rolls over the occupant after he has been thrown out All the injuries followed a rather definite pattern Posteriorly, the sacroiliac joint was avulsed fracturing a portion of the sacrum or ilium in that area Anteriorly both rami of the ischium and pubes were fractured



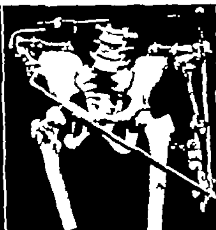


Fig 71. Fig. 72.
(Courtesy of Johnson, W Illinois M. J 112:39-60, August, 1957)

on one or both sides so that the entire coxal bone on one side was separated from its attachment to the opposite side (Fig 71)

A cluster of 3 pins in each iliac crest attached by clamps and bars to other pins in the pubic ramus or subtrochanteric areas controlled the bony fragments from the outside A turnbuckle was then attached to the fixation units to move the fragments into their correct position. The pins were directed in the proper plane through the soft tissues so that there was no pile-up and resultant necrosis of these tissues on one side of the pin. Movement of the pins in the soft tissue was eliminated by firm gauze or felt around the pins Subtrochanteric fixation on the well side and the resultant locking of the hip joint provided a low anchor point for an oblique bar or turnbuckle, allowing rotation of the ilium in the transverse plane (Fig 72) Open reduction of

(3) Illinois M J 112:39-60, August, 1957

fragments that have strayed too far may sometimes be necessary

Better results were obtained with this method than with conventional methods Shortly after fixation 1 patient was able to make an airplane trip of 300 miles After recovery she had a full term pregnancy with normal spontaneous vaginal delivery

► [This technic utilizes a vast amount of hardware, but the results described in treating severe pelvic fractures are exceptionally good. I plan to try it when a suitable case is available.—Ed.]

Contribution to Treatment of Fractures of Neck of Femur Preliminary Report is presented by F E Godoy Moreira and Flavio Pires de Camargo[4] (Univ of Sao Paulo) As a graft of bank bone devitalized and preserved for months

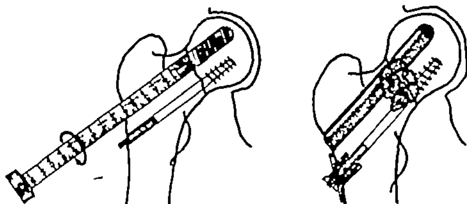


Fig 73 (left) —Tunnel made by special trephine.
Fig 74 (right) —Impaction obtained.
(Courtesy of Godoy Moreira, F E. and de Camargo, F P : Rev Hosp. clin. 12 73-80 Mar Apr., 1957)

takes well on an adequate host and is revascularized there is no reason why the fractured head of the femur should not regularly reunite. For adequate host conditions the gap between the spongy bone of the head and the vascularized spongy bone of the greater trochanter must be eliminated which can be done by filling the practically empty neck of the femur with spongy bone and immobilizing the head and protecting it until it unites A new method of treatment of displaced varus or adduction fractures of the neck of the femur accomplishes this

Technic.—After exact reduction of the fracture by gentle manipulation, the hip is opened. A stud bolt screw is placed close to the

(4) Rev Hosp. clin. 12 73-80 Mar Ap 1957

lower border of the neck and a tunnel made just above and parallel to the screw by a special trephine (Fig 73) The cylinder of spongy bone removed by the trephine is preserved in serum. A tibial cortical graft is placed *in the tunnel and deep into* the head. The spongy bone saved in serum is cut into small pieces and packed tightly into the cavity of the neck, with filling of all dead space proximally and distally to the fracture line, and a good impaction of the fracture is obtained with the flange and nut of the screw (Fig 74) No plaster



Fig 75 (left) —Fracture on Mar 2, 1956.
Fig 76 (right) —Fracture 6 months after operation.
(Courtesy of Godoy Moreira, F E., and de Camargo, F P Rev Hosp. clin. 12 73-80, Mar Apr 1957)

is applied. The patient is kept in bed, and no weight bearing is allowed until x rays show solid union.

In 24 patients results with this method were much better than those with older methods No deaths occurred Union of the fractures was rapid and constant (Figs 75 and 76)

► [Treatment of recent subcapital fractures of the neck of the femur by a high (McMurray type) osteotomy and internal fixation with a nail plate combination has been my own procedure of choice. The combination of cancellous bone graft and internal fixation described by Godoy Moreira and de Camargo is physiologically practical. Union is said to be rapid and constant.—Ed.]

Surgical Treatment of Trochanteric and Juxtatrochanteric Fractures in 149 cases (of a total series of 167) is discussed by J O Ramadier, J Duparc D Rougemont and G de Ferrari[5] (Paris) The fractures were classified as type I

(5) Rev chir orthop. 42:759-786, December 1956.

cervicotrochanteric (39 or 24%), with one break following in general the intertrochanteric line and displacement of fragments in coxa vara with external rotation for which orthopedic reduction is easy (Fig 77 1) type II pertro-

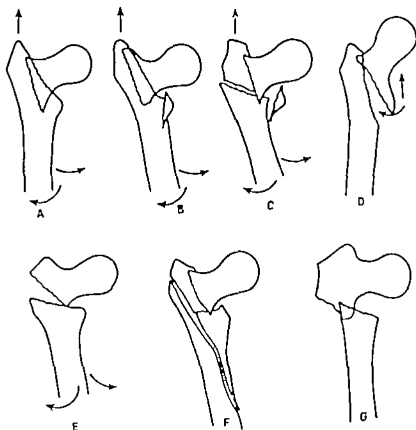


Fig 77 —Various types of trochanteric fractures *A*, cervicotrochanteric; *B*, simple pertrochanteric (often lesser trochanter is detached) *C* complex pertrochanteric (greater trochanter is splintered, displacement is often significant and reduction is unstable) *D* jagged pertrochanteric in coxa valga (exceptional type difficult to reduce); *E* pertrochanteric with intertrochanteric contact *F* trochanterodiaphysial; and *G* subtrochanteric (both trochanters are intact) (Courtesy of Ramadier J O *et al* Rev chir orthop 42 759-786 December 1956.)

chanteric (92 or 55%) with a simple or complex break across both trochanters (*B E*) type III trochanteric-diaphysial (23 or 13 5%) with the fracture crossing the greater trochanter and extending over the upper part of the diaphysis forming a spiral often detaching a third fragment sometime with serious displacement (*E*) and type IV subtrochanteric (13 or 7 5%) with a more or less horizontal break below the two trochanters (*G*)

With good anesthesia as nontoxic as possible and support during operation by blood transfusions surgical risk is low even in aged patients Three procedures were used (Fig 78) medullary nailing (8 cases) Smith Petersen nail plus a diaphysial ring (12 cases) and nail plate (128 cases) The youngest patient was 15 and the oldest 95 (average, 65)

Of the 149 patients operated on 18 (12%) died before the 90th day in 3 postoperative infections were the princi

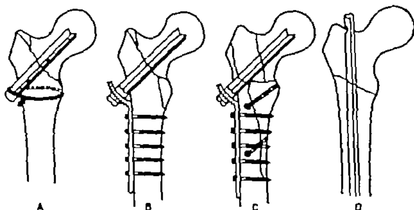


Fig 78.—Various types of osteosynthesis of trochanteric fractures. *A* nail circle (technic reserved for pure cervicotrochanteric fractures is at present abandoned in favor of nail plate) *B*, nail plate is indicated in all pertrochanteric fractures; *C* nail plate combined with surface nailing and diaphysial hoop permits union of trochanterodiaphysial fractures and *D* Küntscher nail is indicated in subtrochanteric fractures provided both trochanters (bitrochanteric mass) are intact. (Courtesy of Ramadier J O *et al.*: Rev chir orthop. 42 759-786, December 1956.)

pal cause Age (all deaths occurred in patients aged 72 95) cardiac complications and progressive decline of general health were the principal factors in the other deaths Among patients operated on before the 3d day, the mortality was 11% and among those operated on between the 3d and 15th day 21% The mortality decreased to 12% when the operation was done after the 15th day, the patients were hospitalized late and had already shown good resistance in surviving the most dangerous period (first 15 days)

Anatomic and functional results in 8 cases of subtrochanteric fractures treated by the Küntscher nail (Figs 79 and 80) were good After osteosynthesis by means of the nail plate or nail circle in 131 cases 17 failures resulted Poor reduction was the cause of malunion in 3 cases and

mechanical errors in the others Functional results did not always coincide with anatomic results

This series demonstrates that operation decreases mortality by reducing complications related to prolonged decubitus in aged patients Results justify early surgical intervention The nail plate constitutes an excellent method of



Fig 79 (left) —Woman, 74 Subtrochanteric transverse fracture with marked displacement

Fig 80 (right) —Same patient, X-ray taken on 40th day

(Courtesy of Ramadier J O *et al*: Rev chir orthop. 42:759-786, December 1956.)

osteosynthesis in most trochanteric fractures provided the impossible is not expected i e sufficient solidification to permit walking with support before bony union occurs Surgical treatment of trochanteric fractures has improved the vital and functional prognosis in aged persons but does not always produce perfect results Comminuted fractures often present difficult technical problems The only real justification for surgery of these fractures in the aged is the palpable reduction in mortality

Nonunion of Trochanteric and Subtrochanteric Fractures was studied by Harold B Boyd and Stanley W Lipinski[6] (Univ of Tennessee) in 28 patients Of these 22 were initially treated by open reduction and internal fixation 5 by traction and 1 by bed rest and sandbags Nonunion is more prone to develop in trochanteric fractures associated



Fig. 81.—Nonunion unquestionable, nailplate broken. (Courtesy of Boyd, H. B., and Lipinski, S. W Surg., Gynec. & Obst. 104 463-470 April, 1957.)

with subtrochanteric fractures (Fig 81) or with fractures of the base of the neck of the femur If absorption of bone occurs about the fracture site, the nail plate may tend to hold the fragments apart thus predisposing to nonunion When nonunion is developing coxa vara occurs causing bending or breaking of the nail plate or screws loosening of the internal fixation or a combination of these factors The result is instability pain in the hip and shortening of the limb The patient and often the surgeon attributes

(6) Surg Gynec & Obst. 104 463-470 April, 1957

nonunion to breaking of the nail plate But the reverse usually is true i e the nail plate breaks because nonunion is developing

At operation placing the hip in the valgus position is most important thus straightening the weight bearing alinement and producing an impacting force at the fracture site To maintain better apposition moderate overriding of the bone cortices is preferable to anatomic reduction Adequate internal fixation is necessary to maintain the valgus position After thorough denuding of the fragment ends to bleeding bone copious quantities of bone chips should be packed about the fracture site especially on the medial side All bony crevices should be filled Onlay cortical grafts may be used in addition to metallic internal fixation but alone they are not adequate for internal fixation With adequate internal fixation body casts after surgery are not required

Further Evaluation of Use of Intramedullary Nailing in Treatment of Gunshot Fractures of Extremities is presented by Ernest A Brav[7] (Walter Reed Army Hosp) Follow up of soldiers treated by this method revealed a satisfactory functional result in 62 of 70 fractures (88 6%)

Twenty-eight fractures were nailed before wound healing Of 16 patients in whom there was wound closure at the time of nailing or a few days later 14 (87 5%) had satisfactory results Of 12 whose wounds were permitted to heal by secondary intention or were subsequently treated by skin coverage 11 (91.7%) had satisfactory results The failures that occurred after immediate wound closure at the time of nailing resulted from use of this closed procedure when there was frank suppuration a definite error If these two obvious mistakes had been avoided and if immediate or slightly delayed skin closure had been done only on wounds which appeared surgically clean there would have been no failures in this group The failure in the group in which the wound was left open was the result of chronic infection and nonunion and this failure might have occurred with any method of treatment because of the severity of the infection and the degree of bone injury

Nailing was done in 42 fractures after complete wound

(7) J Bone & J t S rg 39-A 513-520 June, 1957

healing with satisfactory results in 37 (88 1%) One failure was attributed to osteomyelitis and stiffness of the knee caused by penetration of the knee by the nail The cause of nonunion of the other fractures was not apparent The incidence of failures was no greater than could be expected under similar circumstances with any form of treatment

If optimum operating conditions do not exist gunshot fractures should not be treated by any form of intramedullary nailing Nailing should never be done at the time of primary wound debridement it is wiser to defer it until the usual time of delayed wound closure On the other hand intramedullary nailing may be safely used in selected gunshot fractures in which complete and uneventful wound healing has occurred The indications for and the limitations of intramedullary nailing in these fractures are the same as in closed fractures In general this delayed method is the most appropriate treatment for the great majority of fractures in which nailing is necessary

The patient who presents the greatest problem is the one in whom early internal fixation of the gunshot fracture is urgently required because of marked loss of soft tissue or bone severe pain and debility due to inadequate conservative fixation prolonged frank infection resulting from unsatisfactory immobilization despite adequate drainage or the need to move the patient to treat severe associated injuries

This study has clearly demonstrated that immediate wound closure cannot be safely accomplished in the presence of infection Infected wounds if nailing is indicated should be left wide open and the possibility of subsequent skin coverage should be kept in mind If this principle is followed in selected cases the risk to the patient of nailing through an open wound is no greater than that of nailing after complete wound healing

Medullary Fixation of Fractures Results in 100 Consecutive Cases are reported by Robert Crawford Robertson[8] (Chattanooga Tenn) A Kuntscher or Rush nail was used in the femur a Rush nail in the humerus and tibia a hip guide wire Rush nail or Steinmann pin in the clavicle and radial neck None

(8) South M J 50 837-844 July 1957

of these devices meets the ideal A tight fit within the canal greatly increases the danger of fragmenting the cortex or lodgement of the device during nailing and probably delays bone healing Medullary reaming was necessary in 4 femora and 6 forearms A loose fit or a device of insufficient length results in insecure fixation

The details of fixation were determined at surgery A minimum of foreign material in or about the bone was desired and encircling wire loop or screw fixation was added only if the major fragments could not be apposed and securely maintained by the nail alone the minor fragments were held in at least fair apposition by closure of the surrounding soft tissue In 5 femora fractured in the distal third Rush nails were inserted through the distal end in all other femur fractures, a proximal insertion was used Blind nailing attempted in 4 femora was successful in 1

When open methods with internal fixation are indicated, medullary nailing is the preferred method in many mild or moderately comminuted displaced segmental malunited and ununited fractures in the middle two thirds of the shaft of the femur forearm or clavicle Medullary nailing should be considered as a method of fixation in mild to moderately severe comminuted fractures in the middle two thirds of the shaft of the tibia and humerus that do not respond to closed methods of treatment. It is the preferred method of fixation in many severely displaced segmental malunited and ununited shaft fractures of these bones In long oblique fractures dual screw or wire loop fixation is preferred

In selected patients compounding and previous infection does not contraindicate medullary nailing Medullary nailing although rarely warranted does not appear to be contraindicated in difficult cases in young adolescents after failure of closed methods The medullary nails used are not entirely satisfactory in affording rigid fixation or in preventing migration bending or breakage of the nail and do not eliminate the need for external fixation except in selected fractures of the femur The nails should remain in the bone until solid cortical union is demonstrated by x ray

Intramedullary Fixation of Pathologic Fractures is discussed by Einer W Johnson Jr[9] (Mayo Clinic) A path

(9) J.A.M.A. 163 41 419 Feb 9 1957

ologic fracture increases the suffering of a patient makes nursing care more difficult predisposes to hypostatic pneumonia and decubitus ulcers and sometimes interferes with necessary treatment of the underlying disease Insertion of an intramedullary nail contributes to the comfort and sometimes prolongs the life of the patient Occasionally a pathologic fracture can be anticipated as in metastasis to the femur from tumors in the kidney breast or prostate In 1 patient with familial splenic anemia (lipid histiocytosis of the kerasin type) intramedullary fixation was used prophylactically in each femur to control disabling pain in the thigh thus pathologic fracture was circumvented and the patient was again made ambulatory In 2 other instances of pathologic fractures representing metastases of tumors elsewhere the patients were not rendered ambulatory but treatment was facilitated

It should be emphasized that many but not all pathologic fractures of weight bearing bones are amenable to intra medullary fixation Spread of tumor tissue during insertion of the intramedullary nail may theoretically at least be fostered by any event that causes intramedullary pressure to increase above the systolic pressure Therefore the nail should not be driven too rapidly and shock during or im mediately after the operation should be prevented

Fractures of Femur in Children Analysis of Their Effect on Subsequent Length of Both Bones of Lower Limb Nicholas R Greville and John C Ivins[1] (Mayo Clinic and Found) measured the lengths of the femur and tibia as well as the total length of the leg 2 9 years after fracture of the femur The patients legs were laid on a radiolucent rule with radiopaque centimeter and millimeter markings and cone radiograms of both hips knees and ankles were made on the same plate from a height of 48 in centered directly over the central line at the level of the joints

In 10 of 14 children with fractures in the middle femur the femur was lengthened 0 6 cm (average) It was lengthened most in children aged 4-8 in those who sustained severely displaced fractures that had been well reduced and those who had had fractures treated surgically Femoral length was decreased in 4 3 of whom had had spiral frac

(1) Am. J Surg. 93:376-384 March, 1957

tures In the other child long-continued immobilization caused the shortening In 9 children the tibia was 0 3 cm longer (average) than its fellow In 4 it was shortened Two of the latter were infants and 1 had had long immobilization because of delayed union of the femur

In 8 children the length of the leg on the fractured side was increased (average 0 9 cm) Six children had short legs on the fractured side (average shortening 0 55 cm) The increase or decrease in total length of the leg usually followed the femoral change However if the femur was only slightly lengthened the increase or decrease depended on the change in the tibia and in any case was slight If the bones worked in the same direction the change was greatest it was minimized if the bones worked in opposition It was rare for both tibia and femur to be shortened but not uncommon for one to be lengthened and the other shortened

Clinically differences of 0 5 cm in length were not detected by the tape measure Residual angulation showed little tendency to correct itself and in some cases it was increased

The authors conclude that fractures of the femur in children should be reduced by closed methods to restore angulation and alinement but shortening should not be fully corrected in oblique or transverse fractures In spiral fractures which tend to shorten at the fracture site during the healing period full length should be restored

Diagnostic and Therapeutic Obstacles Encountered in Tibial Plateau Fractures. The end result of maltreated tibial plateau fractures may be a back knee genu valgum or varum lateral instability limited motion painful knee or chronic synovitis To evaluate completely the severity of the injury Julius S Neviaser and Sanford H Eisenberg suggest the use of a tunnel view oblique roentgenographic studies and arthrography besides the routine anteroposterior and lateral views An arthrogram may show some radiopaque material in the extra articular soft tissues (Fig 82) In this instance at surgery a complete rent was found in the joint capsule the site from which the Diodrast® had escaped from the knee joint The significance of this diag

(2) Bull Hosp Joint Dis 17 48-57 April, 1956

Fractures of the upper middle fourth of the bone frequently open and damage to the soft tissues xtensive About 80% of the patients were treated ative methods

s of infection and nonunion were outstanding treated by plate fixation Most of these plates l elsewhere as emergencies Infections occurred s in 8 of whom a closed fracture was treated

series of 97 tibial fractures were treated at y Hospital with similar results Best results when closed treatment was feasible and plas skilfully applied

igement of tibial fractures the following fac carefully evaluated (1) general condition nd the bone and amount of soft tissue injury mpression and continuity with some stability (3) need for surgery and choice of method ition (4) determination early (at about 3 need for a graft it progress of union is not d (5) role of the fibula in healing or preven of the fracture

e greater awareness of the dangers of open depends on the surgeon s skill and judg on his evaluation of primary soft tissue additional trauma of surgery for applica ation With closed treatment results are ere is small risk if (1) skill in applying developed (2) the cast is maintained as t (3) position is checked by x ray after ntil there is bony continuity (4) aline proper wedging and (5) the patient is te as soon as possible.

of Ankle with Fixed Displacement

John I they Leo T Schlenker (St. F s Hosp., Evanston Ill)

th for this syndrome fu be avoided and addi on an already se cation of x rays

56

created in the proximal region of the tibia This cavity is best filled with cortical bone cut from the adjacent tibia or femur Besides filling the cavity this graft acts as a shel to support the re-established joint surface The graft is usually inserted at right angles to the long axis of the tibia and is maintained in situ by a transfixation bolt that is inserted transversely running obliquely from behind forward In this manner the usually depressed posterior fragment con



Fig 83 —Six months postoperative appearance of markedly depressed plateau fracture. (Courtesy of Neviaser J S., and Eisenberg S. H Bull. Hosp. Joint Dis. 17 48-57 April, 1956.)

taining a large area of articular surface is elevated and restored to its normal anatomic relation and a traumatic back knee is prevented

Tibial Shaft Fractures Problems in Management. Leroy O Travis[3] studied the results of various methods of treating fractures of the shaft of the tibia in 413 patients at Brooke Army Hospital More than 40% of the injuries were connected with automobile and motorcycle accidents Results were more directly related to the method of treatment than to the location or type of fracture or soft tissue in

(3) J.A.M.A 1 4 1175 1180 July 13 1957

volvement Fractures of the upper middle fourth of the bone were more frequently open and damage to the soft tissues was more extensive About 80% of the patients were treated by nonoperative methods

High rates of infection and nonunion were outstanding in fractures treated by plate fixation Most of these plates were applied elsewhere as emergencies Infections occurred in 31 patients in 8 of whom a closed fracture was treated operatively

A second series of 97 tibial fractures were treated at Madigan Army Hospital with similar results Best results were obtained when closed treatment was feasible and plaster casts were skilfully applied

In the management of tibial fractures the following factors should be carefully evaluated (1) general condition of the patient and the bone and amount of soft tissue injury (2) contact compression and continuity with some stability of the fracture (3) need for surgery and choice of method of internal fixation (4) determination early (at about 3 months) of the need for a graft if progress of union is not satisfactory and (5) role of the fibula in healing or prevention of healing of the fracture

There should be greater awareness of the dangers of open reduction Much depends on the surgeon s skill and judgment particularly on his evaluation of primary soft tissue injury and of the additional trauma of surgery for application of internal fixation With closed treatment results are satisfactory and there is small risk if (1) skill in applying the plaster cast is developed (2) the cast is maintained as a mold of the part (3) position is checked by x ray after applying the cast until there is bony continuity (4) alinement is corrected by proper wedging and (5) the patient is encouraged to ambulate as soon as possible

Fracture Dislocation of Ankle with Fixed Displacement of Fibula Behind Tibia. John J Fahey Leo T Schlenker and Richard C Stauffer[4] (St Francis Hosp Evanston Ill.) report 3 cases If one is on the alert for this syndrome futile attempts at closed reduction may be avoided and additional damage will not be superimposed on an already severely traumatized joint Careful interpretation of x rays

(4) Am. J Roentgenol. 76 1102 1113 December 1956

of the ankle in fracture dislocation (Fig 84) will make diagnosis possible Treatment consists in open reduction.

In the patients studied the lower end of the upper fibular fragment was locked on the flat tibial surface behind the prominent lower posterior border within 1 cm of the articular surface In an anteroposterior view of a normal ankle,



Fig 84 —Displacement of lower end of upper fibular fragment behind tibia. (Courtesy of Fahey J J et al Am J Roentgenol. 76:1102 1113 December 1956.)

the inferior tibiofibular articulation is not well demonstrated and there is overlap of only a small portion of the tibia on the fibula whereas the lateral view shows complete overlap of the fibula on the tibia. If the fibula is impinged in back of the posterior ridge of the fibular notch it may not be obvious on the anteroposterior view and only detected on the lateral view However if the displacement is near the middle of the tibia the true anteroposterior view will readily visualize the superimposition and the posterior displace

ment will be shown on the lateral view If true anteroposterior and lateral views are not used, the overlap may not be shown in the anteroposterior view or the posterior displacement shown in the lateral view When superimposition in the anteroposterior view and posterior displacement in the lateral view are seen they are usually due to oblique positioning and the condition goes unrecognized

None of the patients treated had any particular complaints when examined several months after open reduction but all had considerable permanent restriction of motion of the ankle or foot. One patient had only one manipulation before open reduction was done and he had a similar degree of permanent disability The major portion of the permanent disability probably results from the type of fracture and severe twisting force producing it rather than from the manipulations

Fracture-Dislocation of Talus with Posterior Displacement of Body and Avascular Necrosis I W Davidson and W J McCracken[5] (Sudbury Ont) reviewed 18 fracture-dislocations of the talus a fairly infrequent injury It is suggested that avascular necrosis associated with injuries of the talus is not due to any particular peculiarity in the blood supply of the talus the incidence is in direct proportion to the extent of damage to the bone its ligamentous and capsular attachments and their blood supply particularly in the interosseous ligament in the sinus tarsi and running deep to the medial malleolus

Treatment of fracture-dislocation of the talus is complicated by (1) danger of sloughing of the skin over the displaced bone with consequent infection or osteomyelitis (2) difficulty in replacing the displaced body of the talus in the tibiofibular mortise (3) interposition of the soft tissue in fractures of the anterior margin of the lower end of the tibia or of the medial malleolus (4) inevitable avascular necrosis and (5) later degenerative arthritic changes in the subtaloid and ankle joints In the past the frequency of early operative multiple fusions was also a factor

Reduction should be done so soon as the fracture is seen to prevent embarrassment of cutaneous circulation infection and osteomyelitis Closed reduction should be tried

(5) J Internat. Coll. Surgeons 27 491-496, April, 1957

only once If it fails, open reduction should be performed immediately A posteromedial incision is used The bones are unlocked by a lever or skid between the sustentaculum tali and the talus and the body is pushed forward into the joint. Reduction is maintained with the foot in plantar flexion If the medial malleolus is fractured reduction is much easier A periosteal flap is removed from the malleolar fracture line the talar dislocation reduced and the malleolar fragment fixed If reduction is difficult the medial malleolus can be fractured sufficiently to allow easier reduction of the body of the talus

The fracture-dislocation once reduced should be immobilized until bony union shows on x rays with a narrow zone of revascularization beyond the fracture line Because of the mechanics of the ankle joint it is hoped that gradual assumption of weight bearing would not cause collapse or fragmentation of the dead body or materially increase the incidence of arthritic changes in adjacent joints Early return to regular occupation is encouraged

Subtaloid fusion can be reserved for subsequent painful arthritic changes in the joint to replace the common combined or triple fusions performed in past years unless other factors e g fracture of the lower end of the tibia with ensuing arthritis necessitate ankle fusion If excision of the talus should be necessary it should be combined early with tibial-calcaneal fusion

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THE SPINE AND PELVIS

Further Observations on Thoracic Disk Protrusions are presented by Kenneth H Abbott Warren H Leimbach and Richard H Retter[7] (Ohio State Univ) based on experience with 15 cases These protrusions are classified into three groups

Group I comprises the central or centrolateral thoracic disk protrusions which most frequently produce long tract signs and when recognized too late are the cause of devastating neurologic signs and symptoms (Fig 86) Severe back

(7) Bull. Los Angeles Neurol Soc 22 58-68 June, 1957

pain is important in diagnosis The pain may be thoracolumbar or mainly lumbar but involves a larger and higher area than is found in the average lumbar disk protrusion Sphincter disturbances may or may not be present. Back pain alone or back and radicular pain may be present for some time before long tract signs appear

In group II the protrusion is of the 11th or 12th thoracic disk usually central or centrolateral (Fig 85) Severe lum-

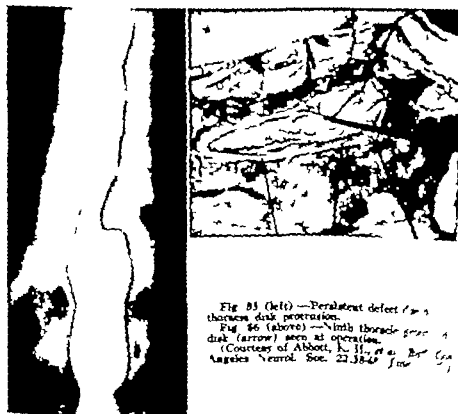


Fig 85 (left) —Persistent defect ... thoracic disk protrusion.
Fig 86 (above) —Ninth thoracic ... disk (arrow) seen at operation.
(Courtesy of Abbott, K. H., et al. ... Angeles Neurol. Soc. 22:38- ...

bar or thoracolumbar backaches and pains often associated with radicular pains and motor weakness in the lateral and lower lumbar segments are common symptoms Saddle area sensory changes and sphincter involvement may or may not be present and 11th and 12th thoracic dermatome sensory changes may be observed

In group III are the laterally protruded disks which cause focal or radicular pains with minor or no demonstrable sensory or motor signs Too often patients with such [illegible]

visceral disease for which unnecessary surgery is performed Most of them have considerable backache pain and muscle spasm Bending the trunk to the affected side aggravates the symptoms in about a third

Diagnosis of any one of these protrusions may be difficult. Severe back pain with muscle spasm and splinting of the back should suggest the possibility of such a lesion Further suspicion may be evidenced by radicular pain long tract signs or a cauda equinal syndrome though none of these differentiate the disk prolapse from a tumor The neurologic examination and myelography must be meticulous At least 9 cc Pantopaque* is needed and occasionally 15 18 cc. is advantageous Right and left oblique films must be taken along with anteroposterior views

There is little or no place for conservative management of thoracic disk protrusions For the central and centrolateral protrusion wide laminectomy is indicated with care to avoid unnecessary pressure on the dura mater and its contents Thoracic nerve roots tolerate traction and pressure as poorly as the cervical roots Most of the laterally placed disks can be removed through partial or complete hemilaminectomy with only minimal traction on the dura and its contents

Spondylolisthesis Surgical Fusion of Lumbosacral Portion of Spinal Column and Interarticular Facets Use of Autogenous Bone Grafts for Relief of Disabling Backache. Henry W Meyerding[8] (Mayo Clinic) has obtained firm, strong fusion of the spinal column by arthrodesis of the interarticular vertebral facets and the use of double massive tibial bone grafts and numerous chips and shavings of cortical and cancellous bone Most of the patients treated were men engaged in heavy work more than half gave a history of trauma Backache (90%) with or without saddle pain or pain in the leg was the common complaint When uni or bilateral sciatica occurs the possibility of a protruded intervertebral disk must be excluded if a protruded disk is present a combined operation is indicated

Spondylolisthesis occurred at the 5th lumbar interspace most frequently (86%) and at the 4th in 11% of the surgi

(8) J Intern l Surgeons 26 566-591 November 1956.

cal cases In 4% the lesion was above the level of the 4th lumbar vertebra or constituted reversed spondylolisthesis

All patients with spondylolisthesis do not have symptoms and the more severe backaches and disabilities do not always afflict those patients with the greatest degrees of displacement About 10% of the diagnoses were made incidentally during examinations for other complaints

Many patients obtain relief by such conservative measures as the wearing of belts braces or reinforced corsets or avoidance of strain and change of occupation Surgical fusion of the 3d 4th and 5th lumbar vertebrae is preferable because it prevents further deformity forestalls increasing disability with pain and restores the stability of the spinal column with a back strong enough to permit useful employment

Review of 73 Cases of Spondylolisthesis Treated by Arthrodesis. In 72 of the 73 cases of spondylolisthesis of the 4th or 5th lumbar vertebra reviewed by George Hammond Robert E. Wise and G Edmund Haggart[9] (Boston) backache with or without lower extremity pain was present in the other case the symptom was that of unilateral sciatica In 35 no history of trauma could be elicited In 5 the 5th lumbar vertebra had slipped forward more than half the distance across the superior surface of the sacrum Symptomatic or neurologic evidence of radiculitis was noted in 15 (21%) cases

All patients were treated by arthrodesis of the spine and excision of any associated intervertebral disk protrusion Three patients (4%) had such protrusions

Results in 60 patients based on a 3-19 year follow up were excellent in 25% good in 40% fair in 18% and poor in 17% Results as estimated by the patients were substantially better Biplane bending x rays of the spine revealed solid ankylosis of the area of arthrodesis in 24 (40%) and pseudarthrosis in 36 (60%) Repair of the pseudarthrosis in 3 patients improved the clinical and x ray results commensurately Results in patients with solid fusion of the spine were good and significantly better than those in patients with failure of fusion All poor results were associated

(9) J.A.M.A. 163 175-180, Jan. 19 1957

with pseudarthrosis Less than half the patients with pseudarthrosis, however had sufficient residual symptoms to warrant surgical repair

Of the 15 patients with radiculitis, 2 had protruded or ruptured intervertebral disks but except for the spondylolisthesis no cause for the radiculitis was established in the rest. The results known in 12 of these, were excellent in 2, good in 5 fair in 4 and poor in 1 Ten had moderate to severe pain in the lower extremities after arthrodesis 4 of whom had solid fusion of the spine and 6 pseudarthrosis.

Every patient with spondylolisthesis should have a careful clinical examination to detect the presence or absence of radiculitis in the lower extremities Most will not show evidence of it and successful arthrodesis alone should bring excellent results In patients with radiculitis preoperative myelography removal of the loose neural arch nerve root decompression exploration for protruding intervertebral disks and arthrodesis appear to be the wisest surgical treatment to minimize the occurrence of postoperative radicular pain

Further efforts should be made to improve the technic of arthrodesis The lumbar spine should be immobilized in a *bilateral spica cast to the knees for 3 months after operation* and early ambulation must be avoided The success of the operation should be verified by x rays and a program of exercise and training should begin as soon as the patient becomes ambulatory

Referred Pain and Sciatica in Diagnosis of Low Back Disability is discussed by George S Hackett[1] (Mercy Hosp., Canton O) The dermatomes of areas of referred pain in the groin lower part of the abdomen genitalia, buttocks and extremities including the toes and in sciatica from specific disabled ligaments of the lumbar and pelvic articulations were outlined (Fig 87) from observations made during the administration of about 8 000 intraligamentous injections in the past 18 years in 1 178 patients Knowledge of these dermatomes is an important diagnostic aid because relaxation of the ligaments is the cause of more chronic low back disability referred pain in the lower extremities and sciatica than any other entity

(1) J.A.M.A. 163 183 185 Jan. 19 1957

The accurate diagnosis of instability of joints from ligamentous relaxation depends on correlation of the (1) history (2) physical examination (3) confirmation of diagnosis and (4) x rays An accurate description and location of the local pain (Fig 88) and areas of referred pain (Fig 87) should be obtained from the patient

The diagnosis is confirmed by "needling" with a local anesthetic solution The point of the needle is inserted with

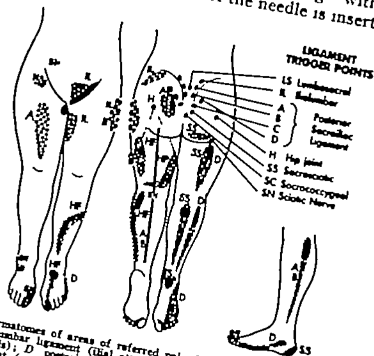


Fig. 87.—Dermatomes of areas of referred pain from lumbosacral and pelvic ligaments. *IL* iliolumbar ligament (iliac attachment); *AB*, posterior sacroiliac ligament (upper two-thirds); *D* posterior sacroiliac ligament (lower outer fibers); *HP* hip articular ligament (posterior superior fibers, pelvic attachment); *HF* hip articular ligament (posterior superior fibers, femoral attachment); and *SS* sacrospinous and sacrotuberous ligament (sacral attachment) (Courtesy of Hackett, G. S. J.A.M.A. 163 183-185 Jan. 19 1957.)

in the disabled ligament. The irritation produced by the needle together with the pressure of the anesthetic solution will immediately reproduce the local pain and often the referred pain both of which will disappear promptly as anesthesia takes place. The diagnosis is foolproof and the patient's confidence is won. X rays are important to rule out other anatomic conditions

The treatment of joint instability from ligamentous relaxation is by prolotherapy (the rehabilitation of an incompetent structure by the generation of new cells) The injec-

tion of a proliferating solution within the fibers of t[illegible] [illegible]xed ligament at the junction of ligament to bone stim[illegible] the production of new bone and fibrous tissue whic[illegible] manently strengthens the "weld" at the fibro-osseous [illegible]tion The *treatments are usually given in the office* b[illegible] more incapacitated patients with extensive involveme[illegible] treated in the hospital where as many as 20 injection[illegible] be given in 1 day while the patient is under analge[illegible]

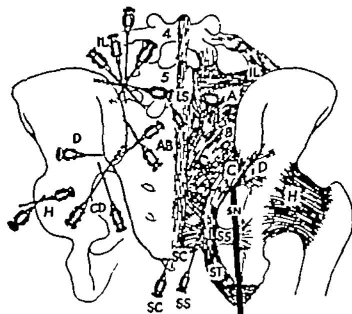


Fig 88.—Trigger points of pain and needles in position for confirmation o[illegible] nosis and for treatment. *IL*, iliolumbar; *LS*, lumbosacral (supraspinous and [illegible]spinous); *A B C D* posterior sacroiliac, *SS* sacrospinous, *ST* sacrotuberous [illegible] sacrococcygeal, *H* hip (articular) and *SN* sciatic nerve (Courtesy of Hack[illegible] S : J.A.M.A. 163 183-185 Jan. 19 1957)

anesthesia The office injections are usually limited to a [illegible] 6 After enough injections are given to cover all disa[illegible] ligaments the patient resumes his usual activities an[illegible] ports for re-evaluation of his condition in 6 weeks The [illegible]tients know when they are cured

The proliferant stimulates the production of new [illegible] within 1 month Any referred and trigger point pain th[illegible] present 4–6 weeks after treatment or recurs later di[illegible] attention to a specific disabled ligament that requires [illegible] treatment Tendon (muscle) attachments to the skel[illegible] become relaxed as do ligaments have trigger point [illegible] referred pain and respond similarly to prolotherapy

At the end of 14 years a survey revealed that 82% of the patients treated with prolotherapy considered themselves cured

Low Lumbar Nerve Root Compression and Adequate Operative Exposure are discussed by Philip T Schlesinger[2]

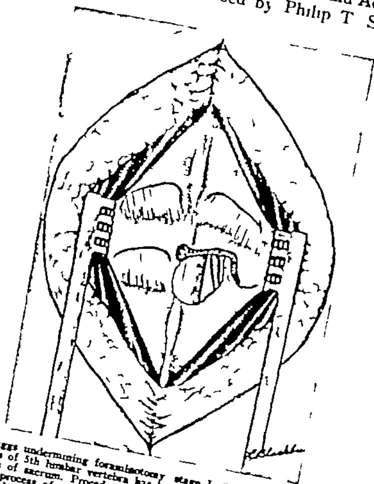


Fig 89 —Briggs undermining foraminotomy, stage I. Some of lamina and inferior articular process of 5th lumbar vertebra has been removed, exposing part of superior articular process of sacrum. Procedure is concluded by excising exposed part of superior articular process of sacrum with osteotome directed at 45 degree angle laterally and anteriorly. (Courtesy of Schlesinger P T J Bone & Joint Surg. 39-A 541 553 June 1957)

(Glens Falls N Y Hosp) A negative disk exploration represents a serious operative failure If severe symptoms persist and further surgery is necessary the second operation will be more difficult and dangerous and results less likely to be successful It is important therefore that at the initial operation the surgeon should feel confident of the

(2) J Bone & Joint Surg 39-A 541 553 June 1957

existence of true nerve root compression so he will pursue the exploration as far as necessary

Before an exploration of the lowest two lumbar interspaces is abandoned as noncontributory an extended exposure by hemilaminectomy facetectomy or undermining foraminotomy should be considered (Fig 89) An ample exposure of the spinal canal is a necessary preliminary and has several advantages (1) The spinal nerve can be clearly seen before retraction and if it lies in a contracted space or is severely compressed or held taut by a large herniation the means by which it may be released and retracted without undue damage will become apparent (2) The extradural veins can be seen and it may be possible to retract the nerve and dura medially without rupturing these vessels (3) The disk is disclosed to direct inspection and even to palpation (4) Even if the exposure of the spinal canal does not show direct evidence of a disk herniation the clear visibility of the spinal nerve, the disk and the lateral recess opening may indicate by evidence found in the spinal canal the direction in which an extended exposure should be carried out Such evidence might be (1) a pathologic condition of the nerve root such as injection edema scarring or enlargement or nerve root adherence indicated by poor retractability or tension of the root, or angulation of the nerve root on retraction (2) a contracted lateral recess, i e the upward projecting articular process approximating the anterior structures (3) evidence of herniation into the foraminal canal or inadequacy of the canal determined by probing or calibration and (4) a positive diagnostic tap test as described by Briggs and Keats

Several cases are presented illustrating certain surgical implications of the bony relations of the low lumbar spine. In Case 1 the clue to herniation of the 5th lumbar disk in the lateral recess was the angulation of the 1st sacral nerve on retraction In Case 2 compression of the 5th lumbar nerve in the contracted lateral recess was suspected when it was seen that the articular process of the sacrum was practically in contact with the body of the 5th lumbar vertebra and that the 1st sacral nerve was placed too far medially to be affected In Case 5, the clue to a dissecting herniation of the 4th lumbar disk was the discovery of the in

jection of the 5th lumbar nerve the dissecting herniation was then disclosed by hemilaminectomy

Surgical Treatment of Herniated Lumbar Intervertebral Disk is reported by F Heppner and O Moshammer[3] (Univ of Graz) Of 342 patients hospitalized because of lower back pain and/or ischialgia 105 had surgery for a herniated intervertebral disk. Of all diagnostic procedures, myelography appeared to be the most reliable. It gave the correct preoperative diagnosis in 85 patients in 13 myelographic changes were due to epidural varices in 5 to scar tissue in the epidural space and in 2 to adhesive arachnoiditis In most patients the interlaminary approach was used at surgery There were no operative deaths Surgical complications included drainage of serous exudate and development of sinuses in 2 patients and peroneus paresis in 2

Follow up examinations were done on 61 patients who underwent surgery The reappearance of symptoms after at least a 6-month symptom free interval was designated a recurrence this occurred in 8 patients 3 of whom had epidural varices at the time of surgery In patients in whom the entire prolapsed disk was removed at surgery recurrence of symptoms could not be regarded as a true relapse, being due either to a new prolapse in a neighboring area or to other causes such as scar formation around the spinal cord.

In acute intervertebral disk herniation even with signs of paraplegia conservative measures which often yield spectacular results should be tried first. If after a few days there is no improvement, myelography should be done, followed by surgery if necessary

The chronic, insidious forms of the disease, with apparent or real remissions are more common In these, surgery is indicated if there is no improvement after months or years of conservative management or if short periods of improvement are followed by relapse several times

Surgery should be done in a lateral position which secures better drainage of the spinal veins In order to alter the anatomy and statics of the spine as little as possible, the procedure is done between the vertebral arches and laminectomy is avoided. If the local findings are unclear or do not correspond with preoperative expectations the

(3) Wien. klin. Wchnschr 68:901-904 Nov 16, 1956.

lateral third of the distal vertebral arch is removed and the spinous process and its ligamentous connections left intact. If an epidural varix instead of a herniated disk is found, it is destroyed and because some hindrance to free drainage in the intervertebral foramen is suspected the posterior wall of the foramen is removed If there is herniation and no prolapse of the disk the disk is incised the protruding disk tissue extracted and the intervertebral space curetted in attempt to facilitate bony fusion of the spinal bodies

Spine Fusion in Young Children Long Term End Result Study with Particular Reference to Growth Effects. Halford Hallock Kenneth C Francis and James B Jones[4] (New York) observed and measured roentgenographically the growth effects of spine fusion in early childhood in 15 patients operated on for tuberculosis and followed into adolescence and adult life In all fusion was successful and the disease of the spine healed In each at least two normal vertebrae were included in the fusion above and below the diseased area Growth changes observed were narrowing of the intervertebral disk spaces in the fusion area with occasional partial obliteration a trapeziform development of the end vertebrae and underdevelopment of the fused vertebral bodies in both the sagittal and the frontal planes (Figs 90 and 91)

Growth continued in the fused area but to a lesser degree than in the contiguous normal and unfused vertebrae Considerable individual variation of growth occurred even in patients who were of similar age when operated on The data obtained in the 15 patients when related to the calculated growth in the normal spine, indicate that on the average fusion at an early age will not diminish ultimate stature to any marked degree as growth in fused normal segments was only 23% less than in adjacent normal unfused vertebrae However when the factors of vertebral body destructi n from disease and consequent inhibition or cessation of g owth were present in addition average loss of growth was greater—37% This was borne out clinically since these children did not develop into unduly short persons over and above what could have been expected from the ravages of the disease itself This confirms the convic

(4) J Bone & Joint 39 A 481-491 June, 1957

tion that in tuberculosis fusion should be done early, before major vertebral destruction and deformity have occurred

Growth of the posterior elements of fused normal vertebrae averaged only 13% less than that in adjacent normal segments Therefore it would seem that there would be



Fig. 90 (left) —Early x ray after fusion from 10th thoracic to 3d lumbar vertebra for tuberculosis at age 3

Fig. 91 (right) —Twelve years later Note lack of change in kyphos at 12th thoracic and 1st lumbar vertebrae, narrowing of intervertebral spaces in fused area, trapeziform development of end-vertebra in fusion and underdevelopment of vertebral bodies in both planes in area of fusion.

(Courtesy of Hallock, H., *et al.* J Bone & Joint Surg. 39-A 481-491 June, 1957)

little prospect of producing significant lordotic deformity by fusion in childhood or conversely little hope of achieving by this means correction in dorsal round back, unless fusion were performed at a very early age and over an extensive area.

Immobilizing Efficiency of Back Braces Effect on Posture and Motion of Lumbosacral Spine In a study of patients with normal spines Paul L Norton and Thomas

Brown[5] (Massachusetts Gen l Hosp) found a wide variation of motion at the lower three interspaces Range of movement and also progression of flexion during the course of forward bending widely varied It seemed that definite flexion patterns exist which may well be of clinical significance The action of various back supports undoubtedly varies according to the lumbar flexion pattern

Close observation of the action of long back supports during forward bending and sitting indicated the concentration of force from the brace was usually at or near the thoracolumbar junction much too high to immobilize the lower lumbar segments In fact, lumbosacral flexion was actually greater in some subjects when a long brace was worn than when it was not

No brace tested did more than limit interspace flexion. Actual immobilization never occurred In the standing position some braces caused interspace flexion others interspace extension Irrespective of this some flexion invariably accompanied forward bending The effect of most braces was to reduce the arc of motion in flexion In several instances the arc of motion was shifted toward the extension side of neutral In these studies no support showed clearly consistent effects on all subjects.

In the same subjects opposite effects were noted at adjacent interspaces with extension at the 5th lumbar interspace and flexion at the 4th or vice versa.

The effectiveness of the supports with respect to immobilization seemed more related to the discomfort produced than to the magnitude of force developed between the apparatus and the back. In no support tested did the force produced over the paraspinal muscles approach an uncomfortable degree during the early phases of forward bending The current use of paraspinal uprights to immobilize the lumbosacral spine seems to be incorrect for two reasons the force is not localized at the points desired and it does not produce the necessary discomfort to cause immobilization The action of a low back brace should be such as to remind the wearer promptly that motion of the spine should be limited by the degree of muscular action. It seems highly unlikely that any device that is applied to the exterior

(5) J Bone & Joint Surg. 39-A 111 138 January 1957

of the body can effectively splint the lumbosacral region

With these considerations in mind, the authors describe a brace which embodies a principle not tried previously By replacing the paraspinal uprights with lateral uprights which extend downward to the greater trochanters and by applying force to the lumbosacral region by a single cross bar two goals are achieved. (1) The force is kept localized over bony prominences so prompt and somewhat uncomfortable pressure accompanies forward bending or slumping in the sitting position. (2) A low point of attachment for the lower straps of the abdominal pad gives good counter-pressure at the lower end of the brace without impeding sitting in the erect position Side bending is effectively blocked by the lateral uprights

The performance of this brace has been superior in restricting flexion of the lower lumbar interspaces in the sitting position During standing and forward bending its effect has been variable. Though usually effective at the 4th lumbar interspace its action at the lumbosacral joint has been to shift the arc of motion toward extension rather than substantially to reduce interspace flexion In its brief clinical trial the performance of the experimental brace has been encouraging

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THE NECK, SHOULDER AND ARM

Examination of Atlantoaxial Joint Following Injury With Particular Emphasis on Rotational Subluxation. According to George Jacobson and Denis C Adler[6] (Univ of Southern California) anatomic characteristics of the atlantoaxial joint are such that its primary function is rotation rather than flexion and extension Consequently injury to this segment frequently results in fractures and dislocations that differ in pattern from those encountered elsewhere in the spine. The atlantoaxial joint may be examined by conventional roentgenography laminagraphy and motion or functional studies

Four patients with rotational subluxation were observed

(6) Am. J Roentgenol. 76 1081 1094 December 1956.

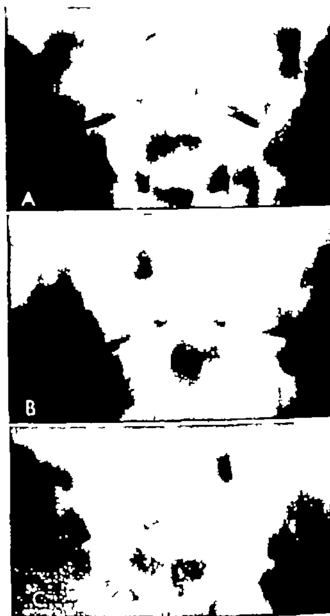


Fig 92.—Motion st ly 4 months after injury shows patient still symptomatic *A* neutral position medial offset f left articular mass of atlas decreased *B* rotation to right, increase in medial offset of left rticular mass, with slight medial offset of right articula ma otation to left, slight increase in medial offset of left articular mass, with moderat m l l offset of right rticular mass (Courtesy of Jacobson, G., and Adler D C Am J Roentgen L 76 1081 1094 December 1956)

In all the unilateral medial offset was present on more than one examination and the rotary motion of the atlantoaxial joint was abnormal In 2 patients the condition was similar in that there was pronounced limitation of motion of the

articular masses of the atlas most noticeable when the head was rotated to the side opposite to the offset. Then the ipsilateral articular mass failed to rotate posteriorly. The offset of the contralateral mass disappeared in 1 of these patients but was unchanged in the other. The authors believe that the articular mass of the atlas on the side of offset was subluxated posteriorly in both of these patients. In 1 of these 2 patients motion returned to normal several days after injury; in the other the abnormal motion persisted during the observation period 2½ months.

In a third patient a motion study made 3 days after injury showed complete lack of rotary motion in the atlanto-axial joint. Several days later motion returned to normal.

In a fourth patient motion of the articular masses of the atlas was almost exactly opposite to normal. Rotation to either side increased the offset of or produced an offset in the contralateral articular mass rather than the ipsilateral mass. To explain these findings the authors believe that the articular mass on the side of offset was subluxated anteriorly. During 4 months this abnormal motion did not change significantly (Fig 92).

In all 4 patients there was good correlation of clinical and roentgen observations. Minimal pain, tenderness and limitation of motion were present in 3 and 1 had moderate to severe pain, tenderness and limitation of motion associated with neurologic changes. Two became asymptomatic with disappearance of the offset and the return of rotary motion to normal, and in 2 symptoms and abnormal roentgen findings have persisted.

Only a few cases of rotary subluxation have been reported, and except in the 2 described here all patients are said to have recovered fully. Careful prolonged clinical and roentgenographic follow up is necessary to determine the eventual outcome of these cases. In some instances in which subluxation persists chronic degenerative changes may develop.

Surgical Fixation of Dislocation of First Cervical Vertebra in Children is described by Jesse T. Nicholson[7] (Univ of Pennsylvania). Dislocation of the 1st cervical vertebra is classified by the position of the articulating surfaces of

(7) New York J Med 56:3839-3843 Dec 15 1956

the lateral masses to those of the 2d cervical vertebra. An incomplete dislocation is a subluxation The dislocation may be anterior right or left rotary posterior or right or left lateral The latter two are associated with a fracture or congenital absence of the dens epistrophei or a fracture of the atlas Dislocation of the 1st cervical vertebra may result from trauma infection paralysis static position or a congenital defect

In dislocation of the 1st cervical vertebra the head is held in a torticollis position This is less marked in bilateral subluxations than in unilateral dislocations There is pain in the occipital region The neck is held rigidly in bilateral dislocations In unilateral dislocations motion in rotation is not possible to the side of the dislocation but motion in lateral flexion is increased to that side In all 1st cervical dislocations the neck cannot be extended Attempts to do so meet with resistance and complaint of pain in the back of the head At times chewing is impossible It is always difficult for the child to open the mouth widely

X ray diagnosis is dependent on anteroposterior and lateral films If the lateral films are taken in maximum extension and maximum flexion of the cervical spine the dislocation is found exaggerated by flexion There is a lordosis of the lower cervical spine. The anterior arch of the atlas appears more than 3 mm anterior to the odontoid unless the latter is fractured. The posterior arch of the atlas appears broader in unilateral dislocations since it is tilted Dislocations should be reduced as soon as possible

METHOD —The dependent head is used as traction to overcome the dislocation. This is accomplished by placing three short mattresses toward the foot of the bed. The patient is held in place by elevating the head of the bed or in the case of small children, by placing Buck s extension on the legs with sufficient weight to prevent their sliding off the head end of the mattress. Reduction generally occurs in 48 hours.

If the dislocation is not accompanied by fracture and is of a few days duration a Thomas collar is adequate immobilization This collar is worn for 6 weeks For dislocations of longer duration or those accompanied by fracture a Minerva jacket is applied The jacket is worn up to 3 months and followed by a Thomas collar for 6 weeks In

recurrent dislocations or irreducible dislocations that remain unstable open fixation with stainless steel wire about the lamina and an overlay bone graft appear a satisfactory method of stabilization

In 2 patients in whom the posterior arch of the atlas was entirely or partially missing the area of fixation was extended from the lamina of the epistropheus to the occiput. Experience with 1 subject in whom fixation was not directed toward producing an arthrodesis was not satisfactory

Cervical Myelopathy Complication of Cervical Spondylosis was studied by Edwin Clarke and Peter K. Robinson[8] (London) in 85 men and 35 women aged 35-80 The degenerative process in the cervical spine is the basic etiologic feature of cervical myelopathy The primary defect is in the disk, which degenerates and promotes osteophyte formation at the periphery of the vertebral body The posterior osteophytes with the overlying ligaments may project into the spinal canal or intervertebral foramens at one or more levels and in some cases encroach on nerve tissue The commonest causative factor is the normal ageing process Cervical myelopathy although produced by apparently discrete lesions presents a pleomorphic clinical picture similar to the varied pattern seen in tumors of this region

As first symptoms any of the following were encountered motor symptoms in one leg usually weakness with or without stiffness motor symptoms in both legs sensory symptoms in the arms or hands pain in the neck shoulder or arms electric shock symptom produced by neck movement sensory symptoms in the legs and motor symptoms in the arms In 75% of the patients the disease process appeared as a series of episodes during which new symptoms and signs appeared. Between these, deterioration occurred in about two-thirds In 20% there was a slow steady progression of symptoms and signs from the time of the initial complaint to the end of observation In 5% there was rapid onset of symptoms and signs followed by a long period during which no new features appeared Ultimately there was some deterioration which brought the patient under observation The cerebrospinal fluid examined in every pa-

(8) Brain 79 483-510 November 1956.

tient had a normal pressure A manometric block was present in 27 In only 3 patients did the white cells exceed 5/cc

Myelography is the most important single investigation There was a hold up in the opaque material in 39 patients. In 23 the plain x rays seemed to indicate a single lesion, but in some of these myelography revealed indentations at levels previously unsuspected

Results of treatment were disappointing with respect to the return of full function If subsequent extension of the disease occurred it was often slow In most instances a trial of neck immobilization is essential If this fails laminectomy with section of the dentate ligaments should be done

Displacement of Cervical Portion of Spine Identification and Assessment. A method outlined by Irvin Deutsch[9] (Miami Beach Fla) of considerable help in assessing disk injuries and subluxations uses lateral x rays of the cervical portion of the spine in various positions

METHOD—With the patient erect and at the greatest target film distance that can be secured with available equipment, three lateral x rays are taken of the neck. These three studies are designated neutral forward flexion" and "backward flexion or extension (Fig 93) The patient executes the last two movements to the limit of ability without aid.

The axes of flexion are arranged as follows A line is drawn parallel to the posterior border of the 7th cervical vertebra, and another is drawn in the same manner to the posterior border of the 2d cervical In the neutral position, the point of intersection is at the 5th cervical level or the 4th to 5th in forward flexion it is at the 4th to 5th cervical level and in backward flexion (extension) it is at the 5th cervical

This schema uses only three x rays that require only simple technic As a screening maneuver it may be all that is needed in cases of early recent injury Obviously it does not replace careful and complete physical and x ray examination If the points of intersection (reference points) are at variance with the points mentioned pathologic change is present (Fig 93) and a full study should be done.

Roentgen analysis of the study must include and note at least the following items (1) deviation of the cervical portion of the spine from the midline (2) alteration of the

(9) J Internat Coll Surgeons 26 592 594 November 1956.

usual lordotic curvature (3) status of the intervertebral foramens both right and left (4) status of the uncoverte bral joints both right and left (5) status of the apophysial

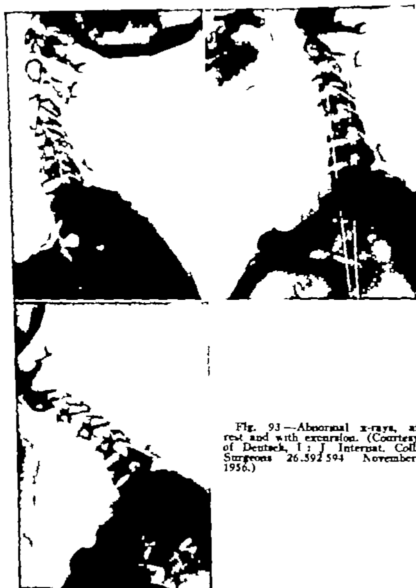


Fig. 93—Abnormal x-rays, at rest and with excursion. (Courtesy of Deutsch, I: J Internat. Coll. Surgeons 26.592 594 November 1956.)

joints both right and left, (6) status of disk spaces and intercartilaginous joints and (7) presence or absence of mineralizations fractures etc.

After injuries to bones and joints x rays may show no departure from normal for weeks or months if vascularity has been impaired though clinical signs and symptoms may

be present During this roentgenographically latent pe much damage may be done by injudicious exercise use of the part Avascularity can be recognized when s cient time has elapsed to permit decalcification of adjac normal bone

► [The title of this paper is misleading The author describes a me of x ray examination of the cervical spine which should be of valu trying to diagnose injuries to the cervical spine. The conditions whic says should be looked for in the x rays do not constitute displacemer the cervical spine. The public is becoming so lawsuit minded that e honest physician must be exceptionally cautious lest he misinterpret findings and aid the unscrupulous fortune seeker to extract exorbi damages for trivial injuries.—Ed.]

Cause and Treatment of Cervical Syndrome According H O Hardt[1] (Univ of Cologne), symptomatology is ch acterized by painful reflectory muscle spasms along cervical spine radiating pain paresthesia and circulati disturbances in the shoulder and arm

The five lower cervical vertebrae have small lateral pr esses the processus uncinati which protect the cervi spine from lateral displacement. They also participate formation of the intervertebral foramens Changes in t intervertebral disks become apparent first in the area of t intervertebral foramens In the early stages of spondylo or osteochondrosis exostoses narrow the interverteb foramens and irritate the nerve fibers passing through t canal Later exostoses appear on the anterior aspect of t vertebral bodies leading to typical beak formation Arthri changes in the intervertebral joints may cause fixation the cervical spine in certain positions which may also a to the narrowing of the intervertebral canal

These anatomic changes do not appear sufficient to eli the cervical syndrome in every patient On the one hand a persons with severe osteochondrosis of the cervical spi without signs of the cervical syndrome on the other han the syndrome may be found in young persons with perfec ly normal cervical vertebrae Some authors feel that foc infections may cause and trigger the syndrome. Certai types of injuries may cause secondary functional and ana tomic changes in the cervical spine, leading to the syndrom

Hardt believes that the bony changes in the cervical spin

(1) Deutsche med Wchnschr 81:2061 2065 Dec. 14 1956.

only predispose to the syndrome and that the development of the actual syndrome depends on pathologic alterations in the contents of the intervertebral canal Treatment should be directed against the main symptoms Mild analgesics, physical therapy, Hydergine when increased sympathomimetic irritability is in the foreground hydrocortisone infiltration in selected patients and x ray irradiation may be helpful

Shoulder Arm Syndrome—Causation Diagnosis and Treatment are discussed by Ralph K. Ghormley[2] (Mayo Clinic) The lesions causing this syndrome may be related to the cervical part of the spinal column soft tissue structures in the cervical region of the spinal column or the shoulder

Osteoarthritis or hypertrophic changes involving the cervical part of the spinal column occur more often and are an equally important cause of pain in the neck and shoulder and arm Some bony encroachment on the foramen of exit of the nerve root may be found. Pain usually is exaggerated by activity and relieved by rest X rays reveal thinning of the spaces between the intervertebral disks and hypertrophic changes around vertebral margins and particularly around the borders of the facets. Traction, with heat and massage and gentle manipulations, usually brings much relief Fixation maintained by a Thomas collar or other type splint may sometimes be necessary

A protruded cervical intervertebral disk can cause pain in the neck and arm Often it can be diagnosed only with a myelogram The protrusion can be relieved by conservative measures in about 80% of cases Subluxations of vertebrae often are the cause of pain in the neck and arm If subluxation cannot be corrected by conservative measures and reduction cannot be maintained *fusion* of the involved vertebrae is indicated

Fibrositis and myositis often involve both the muscular and ligamentous structures or the fascial structures and may be the cause of considerable pain localized in the region of the neck and shoulder particularly over the trapezius muscle. Some pathologic processes usually are present in

(2) Rocky Mountain M. J 54:706-713 July 1957

periarthritis First are lesions of the musculotendinous cuff often degenerative with or without development of calcification and secondary to this subdeltoid bursitis There may be spontaneous or posttraumatic rupture of the musculotendinous cuff Second are lesions of the long head of the biceps tendon with degenerative changes incited by some wear and tear process followed by tenosynovitis and inflammation with adhesions and resulting in a painful shoulder with limited movement Subdeltoid bursitis usually is seen as a part of this process with or without calcification within the bursa due to degenerative changes in the cuff Less commonly other types of subdeltoid bursitis may develop as a result of infection or disease

When acute or subacute pain in the shoulder is caused by tenosynovitis of the long head of the biceps partial or complete relief can be obtained with small doses of deep x ray or by injection of Hydrocortone* into the tendon sheath When relief has been achieved motion should be encouraged Acute tears of the musculotendinous cuff should be treated by splinting in an abducted position or by open repair of the torn cuff

When mild pain is present and a calcified plaque is noted, injection of a 1% solution of procaine hydrochloride or of Hydrocortone* into the plaque may stimulate absorption of the plaque When pain persists excision of the plaque *may be indicated When an extensive shadow of calcification* indicates a calcified bursa, injection therapy may promote healing within a few days If this fails surgical exploration and debridement of the bursa may be indicated

Frozen shoulder' usually causes partial limitation of scapulohumeral movements as a result of adhesions between the cuff and head of the humerus. When the condition is milder limitation of motion can be relieved by active exercises and gentle stretching When limitation of movement is severe manipulation with the patient anesthetized is helpful

Chronic tenosynovitis of the long head of the biceps tendon and rupture of the long head may require open exploration and tenodesis of the tendon in the bicipital groove Myositis or fibrositis with or without acute spasm and wry neck is best treated by light doses of deep x ray

Problem of Ossifications Distal to Medial Humeral Epicondyle was studied by G Viehweger[3] (Univ of Würzburg) The typical finding consists of a pea or bean sized bony structure situated distally to the medial humeral epicondyle. In some instances the distal end of the humerus shows a slight or more pronounced deformity of the epicondyle and of the trochlear region Occasionally there are



Fig. 94 —Right elbow joint immediately after injury (Courtesy of Viehweger G.: Fortschr Geb. Roentgenstrahlen 86:643-652, May 1957)

small additional bony substances between the epicondyle and the bony structure described

Some patients had a history of trauma in childhood or later Others had no such history despite the very similar x ray appearance Figure 94 shows the avulsion of a part of the medial epicondyle and the apophysial ossification center

Differential diagnosis must consider a longer persisting epicondylitis and the smooth round pea-sized ossifications that may develop even in the elderly after contusion of the

(3) Fortschr Geb Röntgenstrahlen 86:643-652, May 1957

soft tissues Occasionally during the growth period there may be several ossification centers in the area of the apophysis of the distant humerus which do not fuse later In athletes bony structures may develop without previous injury

To demonstrate the medial epicondyle and the surrounding area a special technic for axial views is suggested The dorsal aspect of the forearm is placed down the arm is bent about 80 degrees forward at the elbow joint and the central beam is directed perpendicularly to the epicondyle. Since it has not been proved that nontraumatic separations of apophyses of the elbow occur a characteristic deformity of the medial humeral epicondyle may prove a traumatic separation at any time.

THE HAND AND WRIST

Care of Injured Hand is considered by J Malcolm Aste[4] (Univ of Tennessee) Usually the extent of the injury may be determined satisfactorily without exploring the depths of the wound In some patients, such as alcoholics in whom it is difficult to make a diagnosis immediately the skin is closed after the usual care of the wound Secondary repairs are done later Young children usually require repair under general anesthesia when definitive exploration of the wound can be carried out

TECHNIC.—Wounds of the deeper structures are cared for in the operating room Under general anesthesia, the surrounding skin is washed thoroughly with pHisoHex® and water This is followed by thorough irrigation with normal saline solution performed over a modified Bryant basin. This toilet of the wound is important in reducing infection and formation of scar tissue. The hand is then draped and debrided under tourniquet control. Moist sponges are used, and sponging of the tissues is reduced to minimum.

If the wound does not meet the requirements for primary repair of the deeper structures or if fractures are present in the digits or metacarpals all bleeding points are ligated with fine suture material such as 4-0 plain catgut, and the skin is closed. The fractures are molded in position, and the hand is dressed on a Mason universal splint. If there has been loss of skin, this area is covered with a

(4) South. M. J 50:600-604 May 1957

split thickness skin graft. The fingers are dressed separately and ample amounts of fluffed gauze or mechanics waste are used to produce satisfactory compression of the tissues

In cleanly incised wounds involving the flexor tendons, and under 2 hours old, primary repair may be done with atraumatic technic and suture of only the profundus tendon. If the wound does not meet the requirements for primary repair of the deeper structures secondary repair may be done in 3-4 weeks provided the wound heals without infection.

Tendon grafting is satisfactory in repair of the hand if there is good mobility of joints and no excessive scar tissue overlying the tendons The palmaris longus or one of the tendons of the extensor digitorum longus to the lateral four toes is used for the grafts The tendon to the great toe is never sacrificed The divided ends of the extensor tendons should be approximated with the same care used in flexor tendons and the wrist and involved fingers should be kept in extension for at least 3½-4 weeks lest the strong overpull of the flexor action damage the freshly united tendon ends.

Late repair of extensor tendons in the digits is particularly difficult. In the mallet finger" or disruption of the insertion of the extensor tendon at the distal phalanx it is difficult to maintain the distal interphalangeal joint in extension to allow for adequate healing This may best be accomplished by passing a small Kirschner wire down the center of the middle and distal phalanges across the distal interphalangeal joint

If the wound meets the requirements for primary tendon repair primary nerve suture should be done also The damaged ends of the nerves should be trimmed cautiously with a sharp blade and the ends approximated as closely as possible with fine silk—6-0 or 7-0—on a nontraumatic needle Stereognosis may not be regained but some light touch and pinprick are regained and there is definite improvement in the normal feeling of the hand If primary repair of the nerves is not to be done the severed ends should be approximated with one suture of fine silk or tantalum to prevent retraction of the nerve.

Use of the hand as soon as the tissues will stand it must be encouraged

Surgery of Acute Traumatic Lesions of Hand including amputations fractures joint injuries and lesions of tendons and nerves *is discussed by C Verdan*[5] *(Lausanne Switzerland)* Accidental amputations of the fingers present the alternative of shortening to insure padding or conserving to effect reconstruction The full length of the thumb and other fingers should be conserved and the stump covered by a total free skin graft which may be taken from the end of the amputated finger or at the elbow crease. At other levels of amputation the bone is shortened and a palmar flap is cut if possible to obtain a dorsal transverse scar If several fingers are amputated more conservatism in designing atypical flaps or in applying free grafts is indicated An attempt is always made to preserve the two essential functions pinching and grasping

Finger fractures are of numerous types reduction by traction and external molds is often easy but retention is difficult A finger cannot be correctly immobilized without *including the wrist A standard plaster cast to which is* attached a malleable palmer harness for each fractured finger will serve The hand is immobilized in flexion. Extension by transpulpar pegs is dangerous and should be used only in rare cases Axial rotation is avoided For certain diaphysial fractures Verdan suggests a paraosseous pin serving as an internal support

Joint injuries often cause lasting functional disability even when lesions are minor (sprains) Serious distortions and luxations should be immobilized for 3 weeks Abrasive joint wounds are treated by emergency arthrodesis and covering by a graft or a flap

Treatment of subcutaneous tendon rupture is chosen according *to localization Wounds of tendons and nerves* which require good repair to restore motor function and sense of touch are of paramount interest in modern hand surgery Each site poses different indications Primary repair of extensors is the rule That of flexors can be made primarily in certain definite conditions except in the no man s land from the distal palmer fold to the proximal third of the middle phalanx. There tendon grafts are needed The results obtained during the last 2 years have usually

(5) Helvet. ch acta 23 411-451 November 1956.

been favorable whereas previously they were incompletely so The author devised a technic for primary repair in this unfavorable region

TECHNIC.—Only the deep flexor tendon is repaired the superficial tendon is resected. The deep tendon requires as precise technic as a nerve suture. Fine sutures (silk 6-0) are placed at 2-4 epitendinous points as on a neurilemma. These sutures which do not resist traction, are secured by blocking the tendon above and below by a fine stainless transverse steel pin. The sheath is resected for 2 2.5 cm along the side of injury Tendinous callus will then be surrounded by subcutaneous fat and not by a fibrous string The position of the finger during healing is carefully controlled in semiflexion (position of repose) Generally suturing is done in a position other than the one in which the finger was injured Immobilization apparatus and blocking pins are removed after 3 weeks Then active movement is instituted with a support against the palmar surface of the basal phalanx. Partial return to work, which constitutes the best exercise, may begin 8-10 days later The total period of incapacity is 4-5 weeks.

Of 4 patients with thumb injuries 2 obtained 45 degrees excursion 1 20 degrees and 1 (most favorable case) 80 degrees. Of 11 with injuries of other fingers 3 had complete fixation by adhesions In the other 8, angular excursions varied between 20 and 95 degrees for proximal interphalangeal injuries and between 10 and 30 degrees for distal ones

Repair of digital nerves of the palm and collaterals of the fingers is technically possible to the distal third of the middle phalanx. Of 50 nerves sutured failures occurred in 4% of the patients whereas about two-thirds recovered practically normal touch and one third had an incomplete but satisfactory result.

Disability Evaluation Following Hand and Wrist Injuries. Horace E Turner[6] (Univ of Illinois) believes any attempt to evaluate the loss suffered by a workman when two of the fingers of his right hand have been amputated at the proximal interphalangeal joints poses many questions to which the doctor must have answers before the proper award is given the amputee

It must be known whether the injured person is right or left handed The loss of two fingers of an ambidextrous workman poses no special problem but a similar loss to the right hand of a right handed person is worth 20% more than if the loss were to his left hand The patient s age to

(6) S Clin. North America 37 41 51 February 1957

some extent determines how much he can readapt through learning to use his other fingers The extent of loss depends on which two fingers have been partially amputated and it should be determined whether or not the full range through 90 degrees of flexion and extension remains in the metacar pophalangeal joints of one or both injured fingers and whether abduction and adduction movements are impaired The condition of the sensation in the two stumps should be considered because painful stumps reduce the power of grip and also the safety security and endurance of the worker

The position of the amputation scars at the distal end of the involved fingers is important If the soft tissue end of the stump is too bulbous its usefulness is reduced because of the clumsiness created by the shifting soft tissues which usually become painful Circulation in the other parts of the injured fingers affects the sustaining usefulness of the stumps

Sensation of the stump may be impaired either by loss of feeling or excessive sensitivity, as in the presence of neu roma. Sometimes there are phantom pains causing the pa tient distress and psychic torment. If present surgery is usually required to remove the offending neuroma

Many arbitrators interpret the loss of any finger at its proximal interphalangeal joint as constituting 100% loss of the involved finger even though considerable usefulness is preserved if there is a good moving, pain free proximal phalanx. If the index finger is involved the loss is equiva lent to 40 weeks or 16% of an arm The following allow ances are used for the other fingers middle 35 weeks or 14% of an arm ring 25 weeks or 10% of an arm and little 20 weeks or 8% of an arm in each case when the latter is considered equal to 250 weeks

After injury to the wrist with fibrous ankylosis and 10 degrees of flexion pain is usually felt when the hand is used for pushing pulling grasping lifting striking a blow turn ing and performing any of the functions which transmit mechanical forces through the wrist joint The percentage of loss varies with the worker s age and the type of trade he or she follows In fibrous ankylosis of the wrist flexion and extension as well as abduction and adduction are im paired. Rigid ankylosis may be pain free, but is often asso-

ciated with ankylosis of the distal radioulnar joint, causing loss of supination and pronation

With the hand flexed 10 degrees the flexor tendons of the fingers lose the fulcrum support of the volar surface of the wrist which they have if the hand is held in 20-45 degrees of dorsiflexion

Most states transpose losses by considering a worker s normal hand to be worth 190-200 weeks of his earning capacity Loss of the thumb 1 cm distal to the metacarpophalangeal joint causes greater functional loss than a similar finger amputation Amputation of a thumb through the proximal one third of the phalanx usually produces a short stump with impaired motion of the adjacent joint due to a partial fibrous ankylosis The range of flexion and extension of the metacarpophalangeal joint may be through a full normal 45 degrees or reduced to less than 5 degrees Compensation after a thumb injury depends on the degree of grasping speed, employability safety as a worker dexterity and co-ordination security and power of grip and endurance.

Mallet Finger Classification and Methods of Treatment are presented by Donald R. Pratt Sterling Bunnell and Lot D Howard Jr[7] (San Francisco) Mallet finger deformity is a result of rupture of the insertion of the extensor tendon of the finger Among 75 cases it resulted from laceration of the extensor tendon in 30 a crushing injury in 16 and stubbing of the finger in 29 Full function can be restored only if the retracted proximal end of the extensor tendon is accurately approximated to the terminal phalanx or the distal stump of the tendon The tendon ends can be brought together by slight hyperextension of the distal joint and moderate flexion of the middle joint of the finger The internal splint, a longitudinal stainless steel Kirschner wire provides the most satisfactory complete immobilization of the finger in the desired position with minimal difficulty for patient and operator

The Moreau guide (Fig 95) is useful in properly inserting the splint. The guide lines up the finger in the desired position and guides the alinement of the wire through the finger in both the vertical and lateral planes. The wire extends from the tip of the terminal phalanx to the dorsal sur

(7) Am. J Surg. 93:573-579 April, 1957

face of the proximal segment of the finger (Fig 96) The patient is comfortable during the period of splinting and with use of procaine the wire can be easily removed from the tip of the finger in 4 or 5 weeks

Primary repair of the divided tendon required only simple wound care and an internal splint. In patients seen 10 days

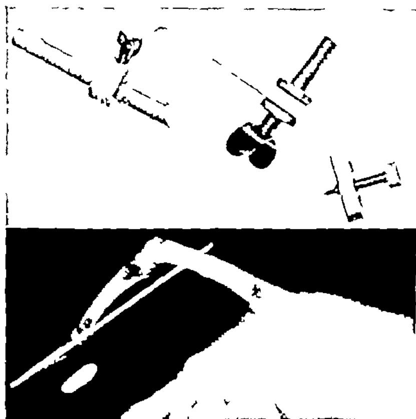


Fig 95 (top) —Guide for insertion of Kirschner wire as internal splint.
Fig 96 (bottom) —Treatment of drop finger deformity by internal splint and reduction of fracture by withdrawable wire loop through fracture site and distal joint. Note only slight hyperextension of distal joint and only 60 degree flexion of middle joint.
(Courtesy of Pratt, D R., et al. Am J Surg 93 573-579 April, 1957)

or more after injury approximation of the extensor tendon by suture was indicated A single no 34 stainless steel wire suture was used fixed over a button or notch in the tip of the fingernail and placed with a pull-out wire so it could be withdrawn in 4 weeks In most late cases the extensor tendon was found to be healed by paratenon with increased length and was usually adherent to the dorsum of the middle phalanx. A small sheet of polythene was placed between

the tendon and the head of the middle phalanx to prevent readherence In 4-6 weeks the membrane can be removed under local anesthesia A cinch type suture was used to shorten the extensor tendon

Useful motion was restored in most patients More motion in the distal joint was obtained in the younger age groups Fractures complicated the functional recovery but were a minimal factor when reduced Local swelling or temporary stiffness of the fingers in the older age group was minimal No damage to the joint or loss of function resulted from use of the internal splint

► [The technic demonstrated is simple, practical and very efficient. I have used the small Kirschner wire in similar cases but without extending the wire to engage the proximal phalanx. However better hyperextension of the distal interphalangeal joint is definitely assured if the wire does engage both the distal phalanx and the proximal phalanx with the proximal interphalangeal joint flexed as demonstrated by these authors Cases that I have treated or have seen treated by this transarticular fixation have shown no evidence of damage to the articular surfaces traversed by the pin.—Ed.]

Intramedullary Wire Fixation of Mallet Finger was originally recommended by Pratt who placed a Kirschner wire through the hyperextended distal joint and passed it volar to the proximal joint and flexor tendons the proximal tip

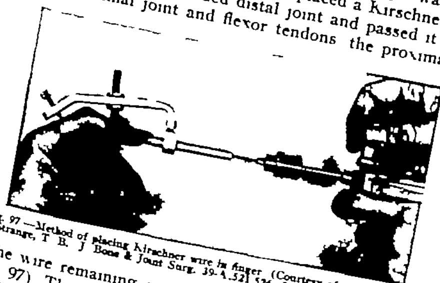


Fig. 97.—Method of placing Kirschner wire in finger. (Courtesy of Casscells, S. W., and Strange, T. B. J Bone & Joint Surg. 39-A:521 526, June, 1957.)

of the wire remaining embedded in the proximal phalanx (Fig 97) Thus both joints are immobilized by one wire S Ward Casscells and Theodore B Strange[8] (Wilmington Del) used this procedure in treating several patients with mallet finger and then discarded it in favor of im

(8) J Bone & Joint Surg. 39-A 521 526, June, 1957

mobilizing only the distal joint with the wire the proximal joint being maintained in 60 degrees of flexion by skin plaster The modified technic is less difficult it eliminates *the danger of painful limitation of motion of the proximal* joint due to injury by the wire and permits more hyperextension of the distal joint (Fig 98) In treating mallet finger by the modified technic, the minimum period of immobilization was 3 weeks and the maximum 5 weeks

Intramedullary wire fixation was used in 20 injuries Results were good in 9 as full active extension of the distal phalanx with slight or no limitation of flexion was achieved Active but not full extension of the distal phalanx and some



Fig 98.—Degree of hyperextension possible is shown. (Courtesy of Cassells, S. W., and Strange, T B : J Bone & Joint Surg. 39-A:521 526, June, 1957)

flexion loss was observed in 7 instances There were 4 poor results due primarily to faulty technic of these 3 patients treated with Pratt s technic had permanent flexion contracture of the proximal joint. In the fourth the wire was placed dorsal to the distal joint through the joint capsule resulting in capsulitis and flexion loss

The best results were seen in patients treated early but even in those treated late results were good when the technic was not faulty Immobilization of the finger in a position of extreme hyperextension probably accounts for the good results seen in patients treated late. If the distal joint is placed in 20-30 degrees of hyperextension enough shortening of the tendon occurs to permit the finger to regain its extensor power and to stabilize the joint.

► [The method described was originally reported by Pratt. An abstract of a recent article by Pratt and Bunnell will be found in this chapter The method is definitely commended.—Ed.]

Use of Single Iliac Bone Graft to Replace Multiple Metacarpal Loss in Dorsal Injuries of Hand in 2 patients is reported by Julian M Bruner[9] (Des Moines, Ia)

CASE 1—Man 26 received a shell fragment wound on the back of the left hand during combat in December 1944 He was right-handed. Examination showed heavy scarring on the back of the hand, to which a split graft had been applied overseas There was pronounced shortening of the hand which was flail in the meta-

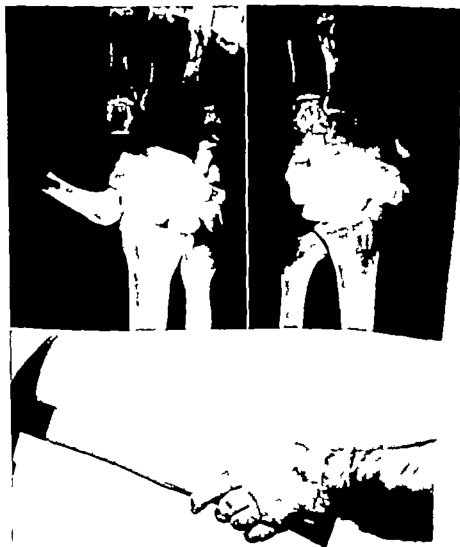


Fig. 99 (top) —Preoperative x-ray films show destruction of metacarpal bones.
Fig. 100 (bottom) —Nine years after iliac bone graft, patient ... ordinary tools.
(Courtesy of Bruner J M. J Bone & Joint Surg. 39-A

(9) J Bone & Joint Surg 39-A:43-52, January 1957

carpal region. The patient was unable to extend the metacarpophalangeal joints because of evident disruption of the extensor tendons of the fingers. Roentgenograms showed virtual destruction of the 2d 3d 4th and 5th metacarpal bones with only fragments remaining (Fig 99) The palmar surfaces of the hand and fingers were uninjured, and there was normal sensation Flexor tendon action was normal but lateral movements of the fingers were limited as a result of gross damage to the interossei Voluntary extension of the interphalangeal joints was present, indicating normal action of the lumbricales

At surgery in October 1945 the cicatrix on the dorsum of the



Fig. 101 —X ray films 10 years after surgery show solid union of bone graft to carpus and to proximal phalanges of fingers, with resulting stability of hand. (Courtesy of Brunner J M. J Bone & Joint Surg. 39-A 43-52 January 1957)

hand was excised and replaced by a previously constructed abdominal tube pedicle graft. In March 1946 the dorsum of the hand was reopened, fragments of the shattered metacarpals were removed and a single large block bone graft from the ilium was used to replace the 2d, 3d 4th and 5th metacarpals Proximally the graft was fixed by Kirschner wires to the distal row of the carpal bones the surfaces of which had been freshly sawed away Distally the base of each proximal phalanx was sawed off at an angle of 130 degrees so the fingers might be slanted into the palm. The base of each proximal phalanx then was fixed into the distal edge of the block graft by Kirschner wires. Care was taken to insure correct rotation of the fingers in the flexed position. Since the metacarpophalangeal joints had been eliminated it was not necessary to replace the extensor tendons. The patient could extend the interphalangeal joints by means of the intact lumbricales.

Follow up in 1955 revealed that the patient had normal sensation no pain and good stability and could hold and use ordinary tools (Fig 100) Roentgenograms in January 1956 10 years after operation showed solid union of the bone graft to the carpus and to the proximal phalanges of the fingers with resulting stability of the hand (Fig 101)

CASE 2.—Boy 9 had sustained a shotgun wound of the dorsum of the left hand. Roentgenograms showed destruction of the 2d 3d and 4th metacarpals with only the head and neck of each metacarpal remaining The thumb 5th metacarpal and the fingers were intact. Reconstruction was carried out in stages (1) pedicle-skin grafting (2) bone grafting and (3) tendon grafting One year after the completed operation the boy had a useful hand and was able to engage in all normal activities of a 13-year-old, including baseball He had good sensation no pain and good stability and could perform the functions of pinch and grasp quite well

The natural curve of the ala ossis ilii corresponds to the concavity of the palm and its thickness is suitable for metacarpal replacement When three adjacent or all four metacarpals have been destroyed large single grafts of this type are technically easier to apply and more stable than are multiple struts inserted to replace individual metacarpals

Hand Deformities in Rheumatoid Disease were studied by D A Brewerton[1] (King's College Hosp London) in 300 patients (232 women 68 men) It was found that any joint in the hand may become restricted in range. Loss of finger flexion is more important than an equivalent loss of extension and loss of flexion in the ring and little fingers is more important than in the index and middle fingers In the thumb loss of opposition is common and loss of adduction or abduction are important in the few patients in whom they occur Increased joint range is an advantage when it occurs in flexion of the carpometacarpal or metacarpophalangeal joints of the fingers It is a disadvantage when it occurs in lateral deviation of the metacarpophalangeal joint of the thumb In the past the importance of ulnar deviation of the metacarpophalangeal joints of the fingers has been exaggerated

The intrinsic muscles of the hand may be the site of fibrous contracture This can cause hyperextension of the proximal interphalangeal joints and probably contributes to ulnar deviation in some patients Tendon lesions are

(1) Ann Rheumat Dis. 16 183-197 June, 1957

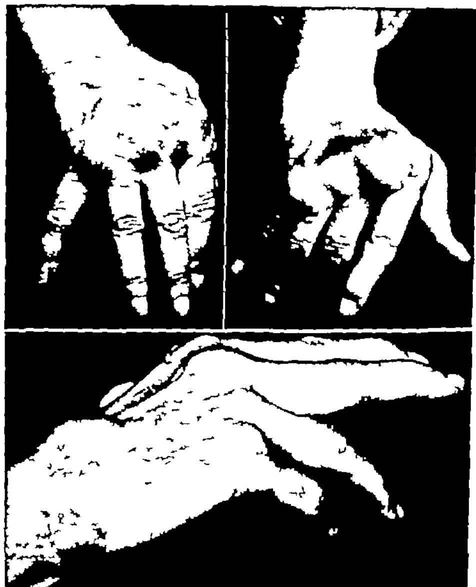


Fig. 102 (top) —Similar deformities at different stages in hands of 2 patients. Four basic abnormalities in more deformed hand, anterior subluxation and ulnar deviation of metacarpophalangeal joints, lateral dislocation of extensor tendons and flexion of carpometacarpal joints of ring and little fingers. In less deformed hand, mild anterior subluxation and ulnar deviation developed together especially in little finger

Fig 103 (bottom) —Spontaneous rupture of extensor tendons.
(Courtesy of Brewerton, D A. Ann. Rheumat. Dis. 16 183-197 June, 1957)

common Trigger fingers usually resolve, leaving no permanent deformity Loss of active finger flexion due to tendon lesions may lead to permanent disability with secondary joint stiffness When there is ulnar deviation there also may be dislocation of extensor tendons (Fig 102) Spon

taneous rupture of tendons is not uncommon (Fig 103)

Every attempt should be made to overcome spasm and contracture by active or passive stretching The best method is to extend the metacarpophalangeal joints while keeping the interphalangeal joints flexed This is not a maneuver that is performed during every-day activities but the patient can be taught to do it as a regular exercise. In instability of the metacarpophalangeal and interphalangeal joints of the thumb arthrodesis or ligament repair can restore useful function Indications for surgery on rheumatoid tendons are not clear and probably could be clarified by further studies of the natural history of tendon lesions

Spontaneous Rupture of Extensor Tendons in Hand Associated with Rheumatoid Arthritis is reported by Lee Ramsay Straub and Edward H Wilson Jr [2] (Hosp for Special Surgery New York) Normal tendons seldom if ever rupture except at their ends as the result of strain Acute trauma to the extensor tendons most often produces mallet finger or boutonniere deformity (Fig 104) In those hands local synovial changes in the lesser finger joints produce conditions favorable for tear by weakening the extensor slips

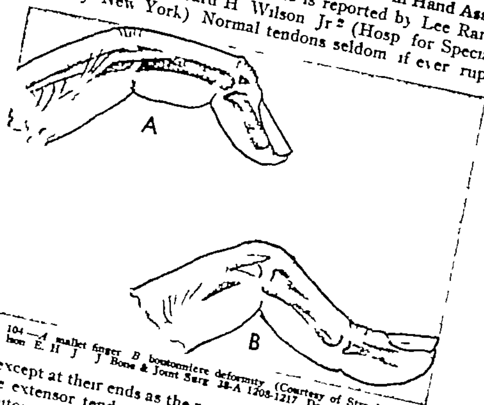


Fig 104 —*A* mallet finger *B* boutonniere deformity (Courtesy of Straub, L. R., and Wilson E. H J J Bone & Joint Surg 38-A 1208-1217 December 1956.)

(2) J Bone & Joint Surg 38-A 1208-1217 December 1956.

In the flexor tendons rupture at the point of insertion or at the muscle tendon junction is the most likely result.

During 4 years spontaneous rupture of tendons was noted in the hands of 7 patients with long standing rheumatoid arthritis of the radiocarpal and inferior radioulnar joints In all the rupture was relatively painless and occurred under normal stress The authors believe that the lesions in 5 of the patients were due to (1) attritional change in the tendon resulting from rheumatoid synovitis (2) attrition due to age and (3) increased mechanical wear and tear due to the prominence of the distal end of the ulna. In the patient with spontaneous rupture of the flexor tendons the transverse carpal ligament provided the same mechanical pressure that the ulnar prominence on the dorsum of the wrist provided in the other patients

Although the basic attritional changes caused by rheumatoid arthritis may remain after the source of mechanical pressure has been removed the tendons may be repaired so that they will provide good function

Cross-Finger Pedicle Flap in Hand Surgery According to Raymond M Curtis[3] (Baltimore) the procedure is indicated in the acute injury that includes loss of skin and subcutaneous tissue particularly when the tendon and the bone are exposed A satisfactory result cannot be expected on the flexor surface of a finger if a split graft is applied over a denuded flexor tendon On the dorsum of a finger an extensor tendon covered with peritenon does well if covered with a thick split graft. The same is true in certain reconstructive procedures In severe flexion contracture of fingers when tendolysis excision of the tendon sheath and volar capsulotomy are necessary to release the finger after scar excision the best result is obtained by immobilizing the finger in moderate extension by a Kirschner wire across the proximal or distal interphalangeal joint and the immediate application of a cross finger pedicle flap

TECHNIC —Figure 105 illustrates various defects and possible sources for procuring a flap of skin and fat from the adjacent finger The flap may be based or hinged proximally distally or laterally on the finger It is well, if possible, to use the standard relation of one to two width to length in preparing the flap. The flap must always be marked out slightly larger than the defect to which it is to be su-

(3) Ann. Surg 145 650-655 May 1957

tured. This eliminates undue tension on the transposed flap when it is sutured into place. When only a small flap is needed, if possible, it should not be elevated from the dorsum of the interphalangeal joint. However when large flaps are indicated or when technically it is preferable to use this area, the end result in the donor finger

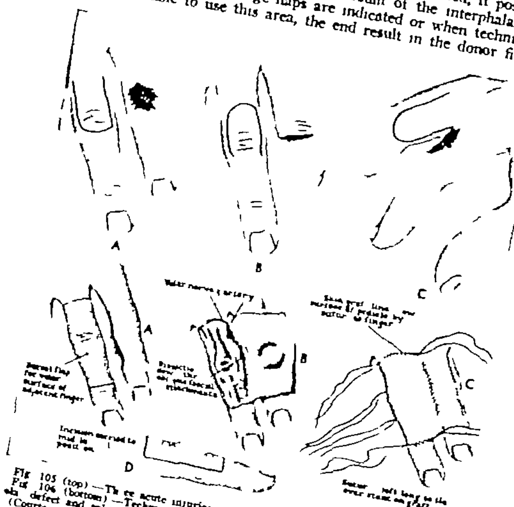


Fig 105 (top)—Three acute injuries and donor sites for cross-finger pedicle flaps. Fig 106 (bottom)—Technic for preparation of cross-finger pedicle flap for large skin defect and split-skin graft to donor area. (Courtesy of Curtis, R. M. Ann. Surg. 145:650-655 May 1957)

does not contraindicate use of this area. Surgery is done in a bloodless field using the arm tourniquet.

Figure 106 illustrates the steps taken in elevating a large pedicle flap from the dorsum of the middle finger for an extensive defect on the volar surface of the index finger. The incision is made through skin and subcutaneous tissue and all vessels encountered are ligated with fine catgut. The subcutaneous tissue is carefully dissected from the peritenon overlying the extensor tendon mechanism in order to preserve the full layer of peritenon over the tendon. The transverse incision extends from the midlateral line of the middle finger on the side adjacent to the index finger to the midlateral line of the middle

finger on that side adjacent to the ring finger (Fig 106 *D*) when such a skin flap is needed to cover the entire volar surface of a finger When less skin is needed and the flap is to be raised in a transverse direction it is always hinged laterally One must be certain not to have the scar fall on the volar surface of the finger As the

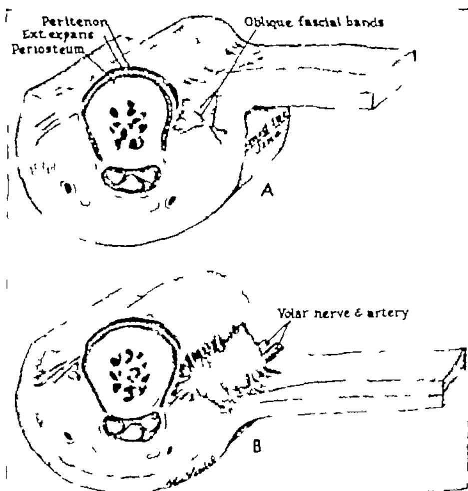


Fig 107—*A* cross section of finger through proximal phalanx showing oblique fascial bands that fix skin to extensor tendon mechanism and periosteum of phalanges; *B* release of skin obtained by dividing oblique fascial fibers. (Courtesy of Curtis, R. M. Ann. Surg 145:650-655 May 1957)

lateral margin of the finger is reached in the dissection it is necessary to separate a layer of oblique fascia, which causes the skin on the lateral aspect of the finger to be adherent to the extensor mechanism and periosteum of the phalanx (Figs. 106 *B* and 107) This dissection is continued volad until the volar digital artery and nerve can be identified (Fig 107 *B*) As soon as these oblique fascial fibers are released, about ¼ in. is gained in length of the flap The flap

must be handled with meticulous atraumatic technic so as not to damage its margins. It is sutured in place with fine nylon sutures.

The donor area then is covered with a thick-split graft 0.015-0.018 in. thick, usually taken from the thigh with the electric dermatome. In case the flap is tiny, the split graft may be taken from the forearm. The graft is carefully sutured in place (Fig. 106 C). It will be noted that the graft extends across the raw surface of the skin flap to be sutured into the raw edge of the adjacent recipient finger in such a manner as to line completely the pedicle flap. Closure of the flap with the graft prevents the secondary infection and scar ring that follow the open flap technic. Six or 8 interrupted sutures are left long to be criss-crossed over a wet cotton stent that is placed over the graft. The portion of the pedicle flap between the fingers is not included in the stent dressing which is tied in. However, wet cotton is lightly packed into this area to make slight pressure on the graft, but not enough pressure to jeopardize the circulation of the flap.

The skin flap is separated in 10-14 days and the margin so trimmed that in the donor finger the juncture line of graft and normal skin falls in the midlateral position.

This technic was used in 17 patients. Results from the standpoint of function and appearance in the recipient finger were excellent. The minimal disability remaining in the donor finger suggests that there is no contraindication to use of an adjacent finger if a real necessity exists for transfer of skin and subcutaneous tissue.

Experience with Transplantation Operations in Loss of Opposition of Thumb. C. L. Jeannopoulos[4] considers the sublimis muscle ideally suited for transplantation operations in loss of thumb opposition. During the past 14 years it was used for this purpose in 112 of 139 cases at the New York State Rehabilitation Hospital. Preference for the Thompson or the Bunnell procedure depends on the strength of the abductor pollicis brevis. However, in this respect the importance of the abductor pollicis longus must be recognized. When a sublimis muscle of good strength is not available, a wrist flexor can be used or, less preferably, a wrist extensor and its tendon prolonged to the thumb with a free graft. If necessary, the wrist may be stabilized by arthrodesis. There are several effective methods for anchoring the transferred tendon to the thumb. In 41 (29.5%) of the cases the transplant was sutured to the tendinous attachment of the abductor pollicis brevis at the base of the proxi-

(4) New York J. Med. 56:1655-1663, Dec. 1, 1956.

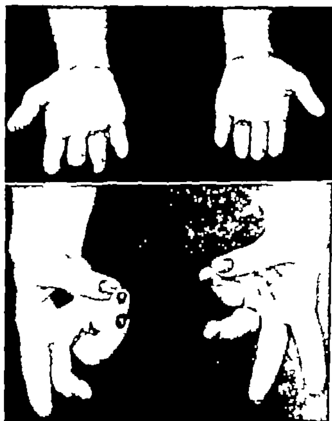


Fig. 108 —In patient with complete paralysis of opponens pollicis in both hands, opposition of thumb is performed by abductor brevis, aided by abductor longus. (Courtesy of Jeannopoulos, C. L. New York J Med. 56:3655-3663 Dec. 1 1956.)

mal phalanx. This technic simplifies the operation and assures correct insertion

It is important to differentiate between thumb opposition and functional opposition the latter is dependent on the over all strength of the hand and not solely on the ability of the thumb to oppose to the little finger (Fig 108) In addition to tendon transference for thenar muscle paralysis other operations may be needed before functional opposition is satisfactorily restored

Reconstruction of Hand after Median Nerve Palsy J Edward Flynn[5] (Tufts Univ) investigated clinically three types of tendon transplantation With motor loss of the median nerve the thumb is incapable of abduction and opposition Proper pinch and grasp are lost. In planning proper tendon transplantation knowledge of the anatomy and

(5) New England J Med. 256:676-682, Apr 11 1957

physiology of the thenar muscles is basic Anatomic dissections show that the abductor pollicis brevis arises from the volar carpal ligament the tuberosity of the navicular and the ridge of the greater multangular It is inserted into the radial side of the base of the proximal phalanx and capsule of the metacarpophalangeal joint Oblique fascial fibers arise from the tendon attachment and are inserted into the tendon of the extensor pollicis longus (Fig 109) Electric stimulation shows that the abductor pollicis brevis muscle

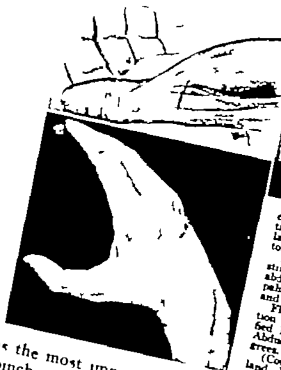




Fig 109 (above left) —Oblique fascial fiber extend from tendons of attachment of abductor pollicis brevis and lateral portion of flexor pollicis brevis to extensor pollicis longus.

Fig 110 (above right) —Electric stimulation of abductor pollicis brevis, abducting thumb to right angles to palm, flexing proximal phalanx radially and extending distal phalanx of thumb.

Fig. 111 (left) —Postoperative function n patient, aged 55 in whom modified Bunnell procedure was performed. Abduction is limited to about 60 degrees.

(Courtesy of Flynn, J E, New England J Med. 256 676-682, Apr 11 1957)

is the most important of the thenar muscles for providing pinch and grasp and adequate abduction of the thumb (Fig 110)

In median nerve palsy all intrinsic muscles of the thumb are paralyzed except the adductor pollicis and the medial part of the flexor pollicis brevis Usually the patient never uses the thumb except at the lateral edge of the palm with the distal phalanx flexed Flexion contracture of the distal phalanx and adductor contracture of the thumb commonly result For normal function of the thumb these deformities must be corrected before tendon transfer

In Thompson s modification of the Royle operation the

flexor sublimis slips are excised from their attachments removed in the palm and attached to the head of the 1st metacarpal and base of the proximal phalanx of the thumb Excellent opposition of the thumb to the base of the ring finger

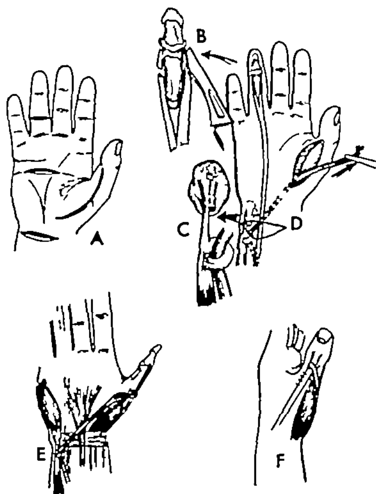


Fig. 112.—Technic for tendon transplantation: *A*, incisions, *B* sublimis slips divided *C* pulley constructed from lateral half of flexor carpi ulnaris; *D* sublimis tendon in pulley and subcutaneous tunnel *E* sublimis slip in tunnel constructed in tendon of abductor pollici brevis, with sublimis slips united; *F* slip of sublimis tendon around extensor pollicis longus, with sutures securing medial part of tendon. (Courtesy of Flynn, J E. New England J Med. 256:676-682, Apr 11 1957)

was attained but adequate abduction of the thumb away from the fingers to permit grasp of large objects was not provided. The Bunnell procedure provided better abduction than the Thompson procedure (Fig 111) but also favored opposition more than abduction

The best operation for median nerve palsy is one of physi

ologic tendon transplantation The flexor sublimis tendon of the ring finger is *transplanted so the pull* on the thumb is exerted in the direction of the origin of the abductor pollicis brevis The transplanted tendon is attached to the tendon of insertion of the abductor pollicis brevis (Fig 112) With this operation abduction of the thumb to 80 degrees was achieved.

Osteogenic Sarcoma in Hand. Malignant tumors of the hand are rare. The commonest is squamous cell carcinoma of the skin The skeletal structures are rarely involved by a primary neoplasm Robert E Carroll[6] (Columbia Univ) reviews 10 cases of osteogenic sarcoma in the hand (8 from the literature) All ages and both sexes were represented about equally One hand was affected as often as the other There was about equal division between metacarpals and phalanges The clinical history of osteogenic sarcoma in the hand is similar to that of this neoplasm elsewhere in the body usually one of pain and swelling In the hand swelling is usually seen long before pain begins Trauma does not seem to be an etiologic factor In 6 cases there appeared to be no complicating factors in development of the tumor other than involvement of the bone itself The reports indicated that local resection as initial treatment offers a good prognosis and a functional extremity

In 2 cases the tumors were induced by ionizing radiation In 1 the radioactive material was injected at a distant site. In the other the tumor was produced by direct exposure of the digit to the penetrating rays of an x ray machine. In both, considerable time elapsed before the final change

Multifocal tumors occurred in 2 cases Development of osteogenic sarcoma in many bones in the body raises the question of metastasis from a single primary tumor or from multicentric tumors arising from a *skeleton* with altered metabolism If the metabolism of bone undergoes the change of osteitis deformans described by Paget the appearance of osteogenic sarcoma is not unusual If tumors arise in several bones it is thought to be due to alteration in the fundamental bone metabolism Should osteogenic sarcoma arise in several bones of the body without evidence of lung metastases the altered bone metabolism of osteitis

(6) J Bone & Joint Surg. 39-A 325-331 April, 1957

deformans is usually present In general a patient with osteogenic sarcoma of bone will reveal lung metastases in the future It is rare for new foci of metastatic osteogenic sarcoma to be found elsewhere before the patient dies Though the number of known primary osteogenic sarcomas arising in the hand is small the prognosis of survival is greater than the 10-20% at 5 years set forth in the literature for osteogenic sarcoma in general

Congenital Deformities of Hands occurring in 89 males and 75 females in 22 years are analyzed by Herbert Conway and John Bowe[7] (New York Hosp Cornell Med Center) During this period the incidence of anomalies of the upper extremity was 1 in 626 live births 31% of which were premature The anomalies were distributed evenly on the right and left sides and were bilateral in 84 patients Associated congenital anomalies were present in 51% of the patients

The single most important factor in production of these anomalies is heredity The pattern of inheritance approaches mendelian expectancy In some anomalies such as syndactyly a familial history often is elicited Amniotic bands long thought to be a cause of congenital absence and of annular grooves of the extremities have never been proved to be a factor in their production Maternal vitamin deprivation during pregnancy (riboflavin vitamin A) especially in strains predisposed to anomaly production will cause an extremely high incidence of anomalies in the offspring Syphilis was not an important factor in production of these anomalies in the study patients Of the two sets of twins in this series one twin in each pair was entirely normal whereas the other had the major anomaly of hypoplasia of the forearm

The most frequent anomaly was polydactyly commonly a supernumerary finger adjacent to the 5th finger The incidence of bilaterality in the supernumerary fingers off the 5th was high 28 of 41 patients In only 1 of the 22 patients with duplicate thumb was the condition bilateral Club hand occurred in 18 and was bilateral in 10 patients This anomaly probably carries with it the poorest outlook of all congenital anomalies of the upper extremity Of the 18 pa

(7) Plast. & Reconstruct Surg. 18:286-290, October 1956.

tients 11 died in the neonatal period due to associated congenital anomaly

The authors prefer to delay surgical correction of digital deformities until age 4-6 unless there is evidence that constricting bands are retarding growth

Congenital Anomalies of Hand According to H Kelikian and Ara Doumanian[8] (Chicago) the primary purpose of surgical reconstruction of congenitally malformed hands is to obtain grasp and appositional or pulp-to-pulp pinch Improvement of the cosmetic appearance is incidental and never undertaken at the expense of function Not only the external appearance but also the skeleton of the hand may be congenitally abnormal Bones may be missing or there may be extra ossicles stunting or overgrowth may be present and the bones may be confluent or malalined Another possible deformity is congenital dislocation of a digital joint and there may be a deficiency in the muscular and tendinous structures The vascular system may be aberrant and a pathologically significant possibility is the presence of a hidden cavernous hemangioma under the volar carpal ligament and palmar aponeurosis

In its motor activities the hand is dependent not only on the integrative action of the brain but also on the stability of the wrist proximally free pronation and supination of the forearm and good functional movement of the elbow and shoulder Operation on the hand is seldom indicated in the absence of any of these factors Also surgery should be avoided if the sensibility of the hand is dulled or muscular control is insufficient

In most cases of congenital malformation of the hand there is no reason to postpone surgery until the child reaches maturity The child should not have surgery involving arthrodesis arthroplasty or joint resection procedures which may damage the epiphysial plate and stunt the growth of the involved bones Other operations however including separation of connected fingers osteotomy of the shaft of the bone tendon lengthening and digital shift can be safely done early in life even in infancy

Restorative surgery often necessitates preliminary or

(8) J Bone & Joint Surg 39-A 1002 1018 October 1957

simultaneous skin grafting Local flaps are used to line the areas directly involved in motion and perception If these flaps are sutured under tension or twisted unduly, they may slough and leave a contracted scar Free full thickness skin grafts are invaluable for covering the sides and volar pads of the distal phalanges They should not be applied over exposed nerves muscles and tendons as they tend to bind and scar

In young children the covering provided for the hand should be sufficiently lax to permit growth and expansion it must be capable of stretching The authors favor pedicle grafts, in which more skin is placed on the hand than is necessary allowing for wastage and future refinements One advantage of pedicled grafts is that they have an areolar seam which allows the underlying joint to move and the tendons to glide However since they are devoid of sensory nerves they should not be used to cover the volar surface of the hands and fingers

► [This is a practical description of the indications for and the technics of surgery on the congenitally deformed hand. It should be read by every orthopedic surgeon.—Ed.]

Osteoid Osteoma of Hand and Wrist. Norman L. Dunitz Paul R. Lipscomb and John C Ivins[9] (Mayo Clinic and Found) point out that osteoid osteoma is essentially the same entity in the hand and wrist as elsewhere in the body Most writers agree that it is a benign osteoblastic neoplasm It is more common in males than in females (about 2 1) In one reported series the incidence was especially high in the late teens and early 20 s The lesions have been described in every location except the skull The location within a bone may be entirely cancellous cortical or subperiosteal Pain the chief symptom is characterized by gradual onset over 2 24 months and is worse at night. Other symptoms depend on the location size and proximity of the lesion to the surface or to the sensory component of nerves On examination a swelling with an area of point tenderness sometimes can be noted. The patient s general health is not affected

X ray appearance varies depending on the location of the lesion When it is in cortical bone or abutting near the cor

(9) Am. J Surg. 94 65-69 July 1957

tex much sclerosis takes place often this obliterates the lesion from the x rays and planigrams are necessary to locate the nidus However when the tumor is entirely in cancellous bone it may have only a thin rim of sclerosis around it. The nidus is noted as a small round or oval area, usually less than 1 cm. in diameter which may be radiopaque or radiolucent

Treatment is surgical x ray and antibiotic therapy have



Fig. 113 (left) —Sclerotic nidus of triquetral bone surrounded by area of radiolucency in wrist of girl, 19

Fig. 114 (center) —Gross specimen removed from same patient; arrow points to nidus.

Fig. 115 (right) —Nidus was 0.8 mm.; shown with surrounding bone. Hematoxylin-eosin reduced from ×60

(Courtesy of Dunitz, N. L., *et al* Am. J Surg. 94 65-69 July 1957.)

been to no avail Simple excision is adequate provided the nidus is completely removed but if any remains recurrence is almost certain Therefore ideal treatment for such a lesion in a bone of the hand or wrist is removal of a block of bone including the nidus After complete removal relief from pain is sudden and recurrence has not been reported

The authors report 4 cases (3 in males aged 17 21 and 1 in a girl 19) of osteoid osteoma of the hand and wrist One patient had the lesion in the triquetral bone a site never before reported (Figs 113-115) All were treated by surgical removal of the lesion with complete relief from pain

Syndrome of Median Nerve Compression in Carpal Tunnel Four Cases Treated Surgically are reported by Bertil Blackberg and Jörgen Fex[1] (Lund) In 3 cases symptoms were bilateral and in all the dominant hand was involved first Although the cause of this condition is not yet properly understood the mechanical factor seems to play a certain role All 4 patients did manual work (farming truck driv-

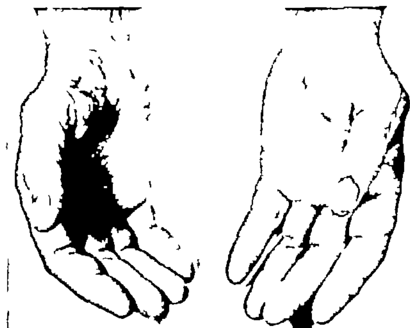


Fig 116.—Typical atrophy for median nerve lesion, affecting proximal outer part of thenar (Courtesy of Blackberg, B and Fex, J Acta orthop. scandinav 26 120-135 1956.)

ing typing metalwork) The patients ages 40 58 58 and 29 were fairly representative The disease usually appears during middle-age or later but when as in 1 patient it is due to some occupational factor or trauma and is unilateral it usually occurs earlier

In injury of the median nerve muscular atrophy is characteristically limited to the proximal radial part of the thenar—so called partial thenar atrophy (Fig 116) It is above all opposition of the thumb that is disturbed with resultant ape hand Decreased sensibility is commonest on the palmar aspect of the 2d and 3d fingers Trophic and

(1) Acta orthop. scandinav 26 120-135 1956.

causalgia like disturbances are not rare in partial injury of the nerve.

In the carpal tunnel syndrome partial atrophy develops successively and corresponding paresis often appears to be less pronounced than might be expected. Grip-strength is poor the hand is clumsy and performance of work requiring precise movement with an instrument held between the finger and thumb is poor The thumb has a tendency to be adducted. All 4 patients showed typical atrophy

The symptoms in 2 patients were initially dominated by paresthesia in the region of the median nerve which gradually developed into increasingly severe burning pain most pronounced at night and accentuated by use of the hand In 1 patient swelling occurred at night but disappeared on rotation or dangling of the hands The clinical picture varies from case to case. Sometimes sensory loss antedates and/or dominates the symptoms of irritation sometimes the motor precede the sensory symptoms

In 3 patients the sensibility disturbances observed were characteristic localized strictly to the region of the median most pronounced in the 2d and 3d fingers and not grave No patient showed trophic disorders but 1 showed an almost causalgia like hyperesthesia Hypersensibility to cold is common and in 1 patient was the only sensibility disturbance No patient showed any disturbance of sensibility in the region of the ramus palmaris As a rule this branch does not pass through the carpal tunnel and escapes compression The absence of sensory loss as in 1 patient does not argue against a carpal tunnel lesion

Unless the condition is diagnosed in time the changes may become disabling and irreversible. Division of the ligamentum carpi transversum often gives relief as noted in 2 patients

Carpal Bridge View Position for Roentgenographic Diagnosis of Abnormalities in Dorsum of Wrist is described by Walter Lentino Herman W Lubetsky Harold G Jacobson and Maxwell H Poppel[2] (New York)

TECHNIC.—The patient is seated. The arm of the wrist to be examined is perpendicular to the body and the forearm is perpendicu

(2) J Bone & Joint Surg. 39-A:88-90, January 1957

lar to the table. The hand lies palm up directly on the cardboard cassette. The central ray of the roentgen beam is adjusted at an angle of 45 degrees with the table top and enters the wrist 2 in. above the table top (Fig 117) The exposure factors used for the average wrist are 100 ma., 1½ seconds, 50 kv., 36-in. target film distance, with a cardboard cassette and a cone

In the roentgenogram produced by the carpal bridge view the proximal row of carpal bones and the soft tissues superficial to the carpal bones are clearly shown The navicular is noted with its long diameter laid out whereas the dorsal portion of the lunate fits snugly between the navicular and the triangular The triangular projects as a triangular density Superimposition of the radius and the ulna on the palmar aspect of this arch is readily identified and the capitate stands out as a large oval bone overlying the inferior margin of the navicular and lunate

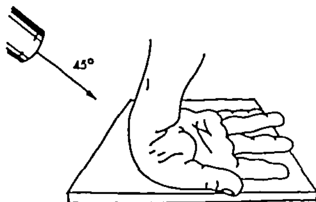


Fig 117—After hand is in position, beam is aimed at 45-degree angle, entering wrist 2 in. above table top. (Courtesy of Lentino, W., *et al.*: J Bone & Joint Surg 39-A:88-90 January 1957)

The carpal bridge view is valuable in diagnosis of *lunate dislocation navicular fracture foreign body in the dorsum* fracture of the triangular and tendinitis calcarea

Perilunar Dislocations This report by Carruth J Wagner[3] (San Francisco) is based on a clinical study of 78 carpal injuries with varying degrees of loss of the normal relation between the lunate and capitate Although a wide variety of fracture-dislocations is possible most follow a sequential pattern

When the navicular is fractured the fragments do not dis-

(3) J Bone & Joint Surg. 38-A 1198-1207 December 1956.

place if the force is dissipated If the force continues the fragments separate and the proximal pole remains with the lunate whereas the distal fragment accompanies the capitate and the rest of the carpus dorsally in the typical perilunar dislocation. If the navicular dislocates but fails to fracture it severs its relation with the lunate and accompanies the capitate or remains behind with the lunate Since its connections with the capitate and the multanguli are the stronger of the two relations the former is what usually happens

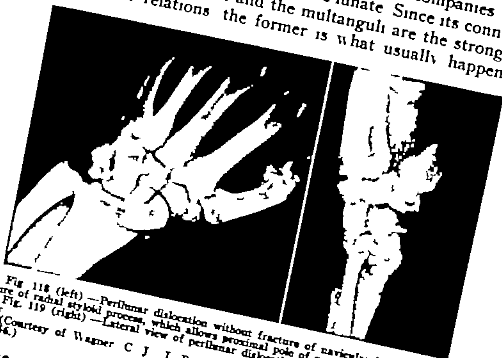


Fig 118 (left) —Perilunar dislocation without fracture of navicular but with fracture of radial styloid process, which allows proximal pole of navicular to escape.
Fig. 119 (right) —Lateral view of perilunar dislocation without fracture of navicular
(Courtesy of Wagner C J J Bone & Joint Surg 38-A 1198-1207 December 1956.)

The radial styloid process often fractures to allow escape of the proximal fragment of the navicular (Figs 118 and 119)

If the force continues after dislocation of the capitate-lunate joint, the carpus usually bypasses the lunate and may be pushed proximally to the level of the articular surface of the radius (Figs 118 and 119) If excessive dorsiflexion occurs the lunate may be popped out of its radial seat like a pumpkin seed resulting in a volar dislocation of the lunate The capitate with its entourage may then assume a relatively normal relation to the radius and on examination it may appear that a simple dislocation of the lunate has occurred That the lunate dislocation was pre-

ceded by a perilunar dislocation can be demonstrated at reduction

Occasionally the capitate is directed more in the axis of the radius and the lunate and the proximal pole of the navicular dislocates dorsally Usually the lunate fractures and only a portion of it dislocates with the proximal pole of the navicular whereas the rest of the lunate and the distal portion of the navicular remain in normal relation to the rest of the carpus

The extent and configuration of the fracture depends on the anatomic variation of the articular surfaces of the carpal bones the direction and extent of the traumatizing force and the position of the hand in relation to the forearm when the force is applied

The result of treatment in the individual case can be predicted by recognizing the presence and extent of associated fractures particularly of the navicular and by accuracy of reduction when closed methods are used When anatomic reduction cannot be obtained by closed methods Wagner recommends arthrodesis of the wrist at once in perilunar dislocation with fracture of the navicular Failure to obtain an anatomic reduction by closed methods when the navicular is not fractured indicates the necessity for open reduction

When the lunate is dislocated with no associated fracture of the navicular closed reduction produces good results When there is dislocation of the lunate with a fragment of the navicular the reduction is rarely accurate and aseptic necrosis of the fragment and lunate is common Primary arthrodesis is the treatment of choice

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THE HIP LEG KNEE ANKLE AND FOOT

Proximal End of Femur Investigations with Special Reference to Etiology of Femoral Neck Fractures—Theoretical Stress Calculations and Experimental Production of Fractures Stig Backman[4] (Karolinska Hosp Stockholm) used fresh specimens of the femur obtained directly at autopsy

(4) Acta radiol supp 146 1957

in the experimental production of fractures Bending shearing compressive and torsional forces and combinations of these forces were used to simulate the effect of a fall on the hip Soft tissue forces were excluded since a fall on the hip gives rise to forces of such magnitude that the muscle force is of relatively little significance.

The results indicated that subcapital fracture is chiefly due to local degenerative changes in the bone tissue Subcapital fractures were produced experimentally at low loads and the character and direction of the force applied had no appreciable bearing on the type of fracture. The character of transcervical fractures was dependent both on torsional moments (even minor ones) and on the soft tissues which form a cushion for the femoral neck. The significance of the soft tissues lies in a functional shortening of the femoral neck whereby the bending moment decreases and the fracture tends more to resemble one of the shearing type

No definite correlation was found between different types of fractures and types or directions of forces applied It was not difficult however to produce medial fractures by duplicating the violence that a fall on the hip constitutes The localization and appearance of the fractures were determined by the character of the bone and of the trauma in combination

Femoral neck fractures are generally caused by a fall on the hip and such trauma cannot initially cause varus displacement The studies suggest that primary capsular injuries directly caused by the initial trauma are less extensive than those found after varus displacement It seems likely that the relatively severe capsular and vascular injuries seen in hip fracture patients are due to subsequent varus displacement and not to the initial trauma. If so it may be possible to obtain better results by taking suitable preventive measures against displacement movements It is important to emphasize the need for greater care on the part of the patients themselves as well as those handling them

Studies of Hip Joint by Means of Lateral Acetabular Roentgenograms. Knox Dunlap Alfred B Swanson and Ralph S Penner[5] (Madigan Army Hosp) offer this method

(5) J Bone & Joint Surg 38-A 1218-1230 December 1956.

as an aid in revealing the relation of the head of the femur to the acetabulum

TECHNIC.—The patient is seated, with the thighs together and flexed to 90 degrees, on a wooden bracket that has metal marker strips on the seat. The x ray tube is placed parallel to the coronal plane of the body, and the Bucky diaphragm is placed so that the film is at right angles to and centered beneath the patient's midline. The tube is tilted until it forms an angle of 30 degrees with the long



Fig 120 (left) —Anteroposterior roentgenogram showing old congenital dislocation of hip.

Fig. 121 (right) —Lateral roentgenogram. Only small portion of head of femur contacts posterior lip of acetabulum.

(Courtesy of Dunlap, K., *et al.*: J Bone & Joint Surg. 38-A:1218-1230, December 1956.)

axis of the body and an extension cylinder is centered over the iliac crest. The 30-degree angle results in the least superimposition of parts

A substitute view of patients in traction has been obtained by flexing the unaffected limb at right angles and placing the cassette against the perineum This was done rather than angle the film between the lower extremities, which is the routine method of obtaining lateral hip roentgenograms

In this series roentgenograms were made of each acetabulum The patient was positioned as described and the first roentgenogram made Then the tube was transferred to the opposite side, without the patient being moved and a second roentgenogram was made by the identical technic.

The roentgenograms were used to reconstruct a superior

inferior image of the pelvis The width of the pelvis was determined by measurements made on the anteroposterior roentgenogram the posterior lips of the acetabula being used as reference points The two lateral roentgenograms were alined in the transverse plane by superimposing the images of the metal bars on each other The distance between the posterior acetabular lips as measured on the anteroposterior view of the pelvis was used to establish the distance between the posterior acetabular lips in the combined lateral acetabular view This facilitated orientation of the separate acetabular roentgenograms to form a complete view of the pelvis A straight line drawn across the two roentgenograms from the posterior lip of one acetabulum to the posterior lip of the other served as a base line A perpendicular was erected to the base line at its point of intersection with the posterior lip of one of the acetabula. A third line was drawn through this point and projected through a corresponding point on the anterior lip of the acetabula. The angle this line made with the perpendicular was accepted as the anterior obliquity of the acetabulum

In over 400 examinations the lateral roentgenograms were of high enough quality to be useful in diagnosis of pathologic hip conditions

Figures 120 and 121 illustrate a case in which the routine anteroposterior roentgenogram did not give a full picture of the pathologic anatomy of the hip joint. The former view suggested fair approximation of joint surfaces where as the lateral acetabular roentgenogram showed that there was actually little contact within the joint and rather marked posterior displacement of the head The lateral acetabular roentgenogram of the hip joint may help in understanding congenital dislocation of the hip joint, its treatment and its prognosis With this view the anterior dislocation can be differentiated from the posterior dislocation the placement of the acetabular roofs can be evaluated and posterior subluxation not revealed in the routine view can be appraised as to importance.

Sepsis in Normal and Premature Infants with Localization in Hip Joint is signaled by regional subcutaneous swelling according to Philip J Howard[6] (Henry Ford Hosp) The

(6) Pediatrics 20 279-288 August, 1957

swelling may be localized to the upper portion of the thigh and the region of the hip or may involve the entire thigh leg and foot The area of swelling may be slightly pink but often there is no local heat inflammation or fluctuation to assure diagnosis Differential diagnosis has to consider regional cellulitis regional phlebitis abscess of the thigh infection of inguinal lymph nodes congenital malformation and trauma to the joint from manipulation at birth Quite often the infant does not use the affected leg as much as the other and cries on movement of the affected leg Mobility of the infected joint however, may not be limited in any way

Howard reports 5 cases in which sepsis in the hip developed before age 30 days Birth weight was in the premature range in 3 and normal in 2 The first clinical sign was swelling in the region of the hip and the thigh The organisms were coagulase positive staphylococci in 3 cases (unknown in 2) X ray changes were slight at onset

Treatment should include general supportive measures including administration of blood and nutritive elements antibiotics and early drainage of the joint to prevent permanent damage of the head of the femur This condition must be suspected in every instance of regional swelling of the hip in the newborn infant Such swelling is an indication for diagnostic aspiration of the joint

Hip Dislocation in Cerebral Palsy Mihran O Tachdjian and William L Minear[7] report that of 590 cerebral palsy patients 25 (4.24%) showed evidence of dislocation or subluxation of the hip Of these 23 had spastic cerebral palsy Muscle studies in the 25 patients showed a dynamic imbalance between the hip abductors and adductors—paralysis of the abductors spasticity of the adductors or both The main function of these two muscle groups is shifting of the pelvis and trunk from the rest position to the side of the weight bearing limb during walking For example if the weight bearing limb is the right, the following movements take place as the left limb starts to swing forward (1) the right abductors contract and incline the pelvis to the right side (2) at the same time the right adductors contract and act as a brake for this movement and are prepared by (3)

(7) J Bone & Joint Surg 38 A 1358-1364 December 1956.

further contraction to initiate the swing of the pelvis to the left side When the left foot reaches the ground the left limb becomes the weight bearer

This alternating pelvic tilt and the normal hip mechanism is disturbed in abductor weakness There is loss of equilibrium To prevent the pelvis from rotating toward the non weight bearing side a person shifts the center of gravity over the affected hip by bending to that side. The resultant force acting through the hip becomes more nearly vertical The equilibrant or reacting forces in the femoral neck also shift toward the vertical The epiphysial cartilaginous plate remaining at right angles to these forces continues to be relatively horizontal and coxa valga results With increased coxa valga due to this abnormal function of the femoral head and acetabular socket subluxation and dislocation of the hip eventually develop The degree of coxa valga is in proportion to the loss of muscle power

Conservative and surgical treatment was used in treating these patients Conservative treatment and prophylaxis included (1) use of the abduction internal rotation splint and of the Frejka pillow for infants (2) passive stretching of the hip adductors and internal rotators i e stretching them gradually so as not to initiate the stretch reflex and (3) establishment of an automatic reflex to cerebral zero hip abductors in an attempt to increase their motor strength and establish a dynamic balance.

Operative treatment consisted of (1) adductor tenotomy or obturator neurectomy followed by closed reduction of the hip and splinting in abduction (2) open reduction and shelf operation and (3) osteotomy to correct coxa valga or derotational osteotomy if marked anteversion were present or both

Of 8 patients treated conservatively (5 with mild subluxation and 3 poor operative risks) 3 had good and 1 fair results Of 17 patients treated surgically 14 had good and 3 fair results

The authors emphasize that dislocation of the hip in cerebral palsy is preventable With awareness of the probabilities and understanding of the pathomechanics every child with spastic lower limbs should be regarded as having potential subluxation or dislocation of the hip

Vascular Changes of Ligamentum Teres Femoris in Disease of Hip A histologic study of the vascularity of 50 specimens of ligamentum teres femoris from 46 patients with disease of the hip and from 4 with normal hips was made by Arturo Valdez Garcia John R. McDonald and Mark B Coventry[8] Degenerative osteoarthritis of the hip appeared to be associated with deficiency of blood supply received through the ligamentum teres Avascular necrosis and cystic changes of the head of the femur seemed related to changes in the vascularity of the ligamentum teres

A normal ligamentum teres can be associated with different pathologic conditions of the hip It is noteworthy that in no case in this series was normal vascularization of the ligamentum teres found associated with ununited fracture of the femoral head In 3 of 4 normal hip joints the vascularity of the ligamentum teres was normal

Slipped Femoral Epiphysis with Severe Displacement Conservative Operative Treatment is discussed by Clarence H Heyman Charles H Herndon and Joseph M Strong[9] (Elyria O) Open reduction through the epiphysial plate or cuneiform osteotomy through the neck of the femur are commonly considered necessary in severe displacements for correction of the deformity and restoration of motion. A more conservative operative treatment osteoplasty is proposed This operation consists in removing the angular or rounded prominence of bone at the neck of the femur where it joins the femoral head (Fig 122)

TECHNIC.—The Smith Petersen approach provides a good exposure. The joint capsule is incised longitudinally at the anterosuperior aspect of the neck of the femur and transversely at the rim of the acetabulum. The articular cartilage covering the head may not be readily identified because the epiphysis may be rotated far backward and downward. By adducting the hip and rotating it externally the margin of the articular cartilage may be brought into view The cartilage should not be damaged. It is unimportant to try to identify the epiphysial line. The hip is moved through all its ranges of motion, noting where the bony ridge or prominence impinges against the rim of the acetabulum. The periosteum is incised in the long axis of the femoral neck and, transversely a short distance at each end of the incision. The periosteum is not raised more than is sufficient to expose the surface of the bony prominence. The extent and place of obstruction can then be clearly seen. With a curved osteo-

(8) Proc. Staff Meet. Mayo Clin. 31:599-604 Oct. 31, 1956.
(9) J Bone & Joint Surg. 39-A:293-303, April, 1957

tome, enough of this bone is removed to allow unrestricted hip motion in all directions Chiseling off this protuberance in one large piece should not be attempted. It is a remodeling or plastic procedure the bone must be removed a little at a time in layers in order to refashion the neck of the femur and accommodate it to the rim of the acetabulum. The surface should be made slightly concave if

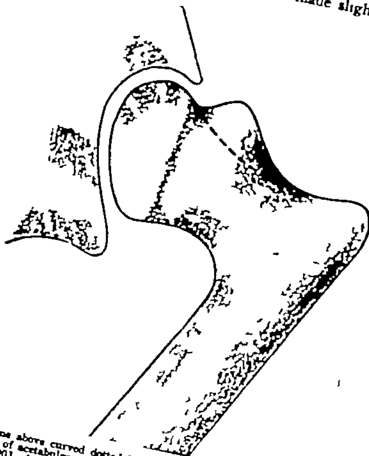


Fig 122.—Bone above curved dotted line is portion removed to relieve obstruction to motion at rim of acetabulum. (Courtesy of Heyman, C. H., et al. J Bone & Joint Surg. 39-A 293-303 April, 1957 from Vulpius, O., and Stoffel, A. Orthopädische Operationslehre [Stuttgart, F Enke, 1913].)

this can be done without removing as much bone as would weaken the neck of the femur Nothing is done to the rim of the acetabulum. Tearing or fraying the elevated periosteum cannot always be avoided. If possible, the periosteum should be neatly sutured over the raw surface of the bone so that the membrane may prevent regeneration of bone growth from the raw uncovered bone surface.

Patients whose epiphyses are seen by x rays to be nearly fused require no postoperative protection other than a plaster boot with crossbar behind the ankle or a plaster spica worn for about a week so that the extremity will not lie in external rotation. Passive mot

to the limit of comfortable tolerance and without irritation is done promptly and active exercises are begun without delay The patient is encouraged to be up and about with crutches and weight bearing and to discard crutches as soon as he feels he can do without them.

If preliminary x rays show that the epiphysis is not fused and that further displacement might occur epiphysiodesis by a graft of cancellous bone across the center of the epiphysial plate is done to induce prompt fusion This takes little extra time. The bone which has been removed to obtain free hip motion may be used for the bone graft instead of obtaining graft material from the crest of the ilium. Although early postoperative active motion is prescribed, hips subjected to this procedure must be protected from weight bearing until good consolidation has occurred. By this combined operation, restoration of good motion correction of deformity and stimulation of prompt fusion can be accomplished.

Twenty five patients underwent osteoplasty The average follow up was 6 years Restoration of good motion and function correction of deformity and relief from pain were achieved with little residual limp However the true results cannot be known before middle age for it cannot be determined before then if the hips treated by this method will stand up under the stresses and strains of years of physically active life

► [The operation described is relatively atraumatic. The results reported are excellent. However it will be necessary to wait until these patients are in their 4th, 5th or 6th decade to see whether or not these hip joints break down and undergo marked degenerative changes, because of imperfect articulation between the displaced femoral head and the acetabulum, before knowing whether the method is worth while. These cases should be followed by the authors to determine whether or not they do develop osteoarthritis changes commonly noted secondary to old slipped femoral epiphyses.—Ed.]

Treatment of Nonunion of Femoral Neck Fractures is discussed by Robert T McElvenny[1] (Northwestern Univ) Delayed union between femoral head and neck is revealed as follows (Figs 123-127) overproduction and progressive production of callus at the fracture site settling or shifting of the femoral head in the anteroposterior or lateral view shifting or moving of metal condensation at the fracture line increased density of the head and inability of the patient to control completely and painlessly the affected extremity The femoral head suffering delayed union may usually be saved for a full functional unit if delayed union is rapidly converted into bony union before 9 months post pinning

(1) S Clin. North America 37:251-268 February 1957

The Smith Petersen nail or other flanged nails are not large enough to fill completely the neck cavity side to side and thus grab hard cortical bone Slight rotary motion be tween the head and neck is often allowed if single pins or nails are used (Fig 128) Adding two smaller pins with the nail is desirable. If a bone graft is used along with a nail the graft should center the head

Only the transcervical type of fracture may be properly



Fig. 123 (left) —Adequate reduction of transcervical fracture neck fragment on head has caught into neck and is supported by neck bone to bone.
Fig 124 (right) —Rapid bony union ensues. Nail has little purchase in head. Motion of metal is slight as forces are bon to bone with fragments steadied by metal (Courtesy of McElvenny R. T : S Clin. North America 17,251 268 February 1937)

reduced and pinned. Routinely this fracture properly re duced and fixed offers results approaching the normal

Displacement osteotomy is most satisfactory for restoring painless hip motion The medial displacement of the shaft throws the weight toward the center of the body The medial shift of the shaft cuts down the length of the lever arm of the neck Displacement osteotomy relieves pain and offers tremendous endurance to most people regardless of the appearance of the femoral head or hip joint For this procedure the femoral head should be detached from its neck and all fixation material cleaving head to neck be it metal or bone should be removed before osteotomy

Displacement osteotomy for nonunion between femoral head and neck was done in 21 patients 19 obtained good and

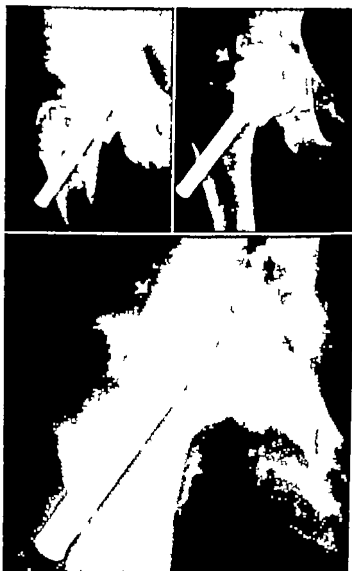


Fig. 125 (top left) —Inadequate reduction of transcervical fracture. Fragment on lower surface f head i below and away from neck. Six months after pinning; weight bearing is started.

Fig 126 (top right) —Twelve months after pinning and 6 months after weight bearing was begun. Patient was never without hesitancy in gait, limp and some pain in groin. Complete internal rotation lacking Note callus proliferation at arrow condensation at fracture line, shift of head and of metal.

Fig. 127 (bottom) —Eight years after pinning. True bony union has ensued, but too late to give functioning head. Hip could have been saved by displacement osteotomy when delayed union showed so plainly in top right figure.

(Courtesy of McElvenny R. T : S. Clin. North America 37.251 268, February 1957)

prompt union and have practically normal gaits and full activity regardless of the appearance of the femoral head

Angulation osteotomy is indicated primarily in subcapital hip fracture. It is also indicated in the treatment of delayed

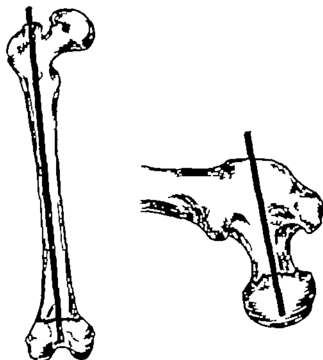


Fig. 128 —Use of rod in supracondylar fracture is questioned. It is assumed nail will hold similar fragment at hip where forces are as many as at supracondylar area of femur (Courtesy of McElvenny R. T S. Clin. North America 37:251 268, February 1957)

union between head and neck when the head is in a satisfactory relation with its neck or can be placed in satisfactory position by severe traction

Muscle Pedicle Bone Graft in Arthrodesis of Hip A H Crenshaw[2] (Univ of Tennessee) states that a bone graft that retains at least partial viability after transplantation should promote more dependable osteogenesis than one completely divested of its blood supply This is true when a muscle pedicle bone graft is used in arthrodesis of the hip Most procedures described to produce fusion of this joint utilize supplemental bone grafts usually from the ilium In 1952 Davis presented a method using an iliac graft which retained its periosteal and muscle attachments on one sur-

(2) South. M. J 50:169-177 February 1957







Fig. 129.—Bone graft in boy 15, showing fusion at 13 weeks. (Courtesy of Crenshaw, A. H.: South. M. J. 50: 169-177, February, 1957.)

face. The author used his method with modifications in 10 patients

TECHNIC.—The anterior iliofemoral approach of Smith Petersen is used. The distal portion is developed in the routine manner between the rectus femoris and tensor fasciae femoris muscles. The sartorius muscle is detached from the anterior superior spine of the ilium and the iliacus and abdominal muscles are stripped from the crest and medial surface of the ilium. The muscles on the lateral surfaces are not disturbed.

By osteotomies in the vertical and lateral directions a graft of appropriate size is obtained from the anterior iliac crest without disturbing the attachments of the tensor fasciae femoris and anterior fibers of the gluteus medius and minimus muscles. The muscle pedicle is developed by sharp dissection in line with its fibers and along with the graft is reflected laterally Bleeding is controlled with hot packs.

After the direct head of the rectus femoris muscle is detached, the capsule is opened and the hip dislocated. Then a routine intra articular arthrodesis is performed and the hip reduced. A slot is made in the ilium above the acetabulum and in the head and neck of the femur to receive the graft. The location of the slot is determined by placing the graft over the area it is to cover An intertrochanteric osteotomy is done. The graft is placed in the slot and secured with a screw in the ilium and one in the neck of the femur After closure of the wound, Davis immobilizes the extremity with skin traction in bed for 7 10 days.

This technic was not followed in several respects Osteotomy was done in only 2 patients Various methods were used for fixation of the graft, and in some it was placed with its wide free surface rather than its edge in contact with the ilium and femur A spica cast was applied immediately after closure in all instances

There was only 1 failure In 9 patients the average time for x ray evidence of bony fusion after operation was 15 weeks (Fig 129) It is felt that in these patients fusion occurred somewhat earlier than after an intra articular arthrodesis supplemented by a free graft

Changes in Fresh Autogenous Whole Thickness Skin Graft Used as Interposition Material in Arthroplasty of Hip Joint on Cats Preliminary Report. Kauko Kettunen[3] (Univ of Helsinki) operated on 6 cats and followed them for 10-90 days

TECHNIC.—The hip joint was opened under ether anesthesia through a lateral incision. The interarticular cartilage was removed

(3) Ann. chir et gynaec. Fenniae 45 193-196, 1956

from the acetabulum and a fresh autogenous whole-thickness skin graft was placed in the joint, with the epidermal side against the freshened surface of the acetabulum. The transplanted skin flap was attached to the rest of the acetabulum by sutures The head of the femur was reduced to its original position. The wound was closed and the leg immobilized under the belly The bandage was removed after 2 weeks and the cat allowed to move about freely After a certain observation period the cats were killed. The whole acetabulum was removed fixed and decalcified.

The fresh autogenous whole thickness skin graft transplanted into the joint retained its vitality The skin flap did not stick to the interarticular cartilage At the initial stage the transplanted skin must not be subjected to excessive pressure which may cause necrosis

About 10 days after operation new granulation tissue was seen between the skin graft and the bone surface. Some entered into the transplanted skin between collagen fibers When the joint resumed normal function the structure of the fibers in the new connective tissue and the collagen fibers of the skin graft began to change to meet the requirements of joint function The collagen fibers arranged themselves tangentially to the joint surface i e at right angles to the active pressure component. This resulted in a fibrillar connective tissue with a microscopic structure resembling that of tendon The epidermal parts of the skin seemed to disappear under pressure. Two weeks after operation only islands of epidermal tissue were seen amidst granulation tissue and the function of the joint seemed to prevent the formation of any epidermal cysts

Constructive Hip Surgery with Vitallium Mold Report on 1,000 Cases of Arthroplasty of Hip over 15 Year Period is presented by Otto E. Aufranc[4] (Massachusetts Gen'l Hosp) Arthroplasty was performed on both hips in 193 patients Supplemental surgery was needed in 225 sepsis developed in 43 There were 3 deaths Excellent to good results were achieved in 220 patients satisfactory in 600 180 operations failed After surgery pain subsided in 22% of patients 31% had only slight to no pain at rest and 29% had moderate pain at times The commonest surgical complications were thrombophlebitis (50 patients) pulmonary emboli (37) and subluxations (16)

(4) J Bone & Joint Surg. 39 A.237 248, April, 1957

It is felt that weight bearing must be actively protected until the full range of motion is obtained If early full weight bearing is allowed (under 6 months) the patient may wear through the healing on the head of the femur and in the acetabulum Some patients were comfortable until some specific episode produced pain on weight bearing from which they never recovered Sitting too long standing improperly or frequently abusing the hip in other ways such as trying to catch up on exercises will produce this result. At supplemental surgery, this wearing through the healing is readily seen

Another lesson learned is the need to transplant the iliopsoas tendon to the anterior medial border of the distal portion of the capsule to give the tendon a direct pull for function This was shown by finding the tendon embedded in the scar tissue between the mold and the acetabulum Through having the muscle pull directed across the front of the mold the muscle functions more efficiently stabilizes the joint, diminishes the tendency to a permanent flexion deformity and prevents a position of external rotation In patients with a short femoral neck or in those with no neck, as in a shaft arthroplasty the greater trochanter with its attached abductors must be moved down the lateral portion of the shaft or the tendons of the abductors must be inserted into the vastus externus

It is thought that reconstruction of the hip is not complete until the joint is relatively stable through its major functional positions The head of the femur and acetabulum must be reconstructed and reshaped until they fit comfortably together with the interposed mold without strain. The muscles that are to move the hip should have functional force lines toward stabilizing and moving it efficiently In surgical closure of such a hip the tissues should fall together without undue tension A full range of motion should be obtained before full strength is sought, for this will prevent excess new bone formation A long period of walking with crutches with a comfortable amount of partial weight bearing as a major part of the exercise program is recommended this should be continued until the hip is strong In any patient who has a tendency to limp adequate support to prevent limping is necessary This may mean that a cane

a crutch or crutches are needed to support the muscles part of the time until they are strong

Practically all arthroplasties were done through the anterior approach and followed generally Smith Petersen's technic To this the following steps were added

TECHNIC.—The skin and subcutaneous fat and fascia are isolated from the depth of the wound by suturing a saline moist gauze handkerchief to the deeper layers. The gluteus minimus tendon is almost routinely tenotomized at the greater trochanter to allow exposure of the superior part of the femoral neck without undue reflection of muscle from the lateral wing of the ilium. The capsule, synovial membrane and the straight and reflected heads of the rectus femoris muscle are reflected from the front of the joint in one piece. As nearly as possible the capsule and synovial membrane are left in place to protect the surrounding structures from the normal trauma of bone work in reshaping the joint. Finally after thorough irrigation of the wound the entire synovial membrane and capsule are excised This removes all traumatized tissue and leaves freshly cut surfaces for healing in the depth of the wound. All devitalized strands of tissue are excised

At times the exposure is made easier by tenotomizing the iliopsoas tendon as well as the gluteus minimus specific in patients with a shallow acetabulum or congenital dislocation of the hip In these conditions the acetabulum must be deepened medially and the function of the hip secured in a more medial position. By transplanting the tendon of the iliopsoas to the anterior distal portion of the capsule the hip is stabilized in this new position. The muscle has a straighter pull for function in flexion in this position.

Surgical closure of a wound about a joint requires approximation without undue necrotizing tension. After closure of the wound and after the sutures have been tied, the joint should be moved through its full range of motion

► [Dr Aufranc is to be congratulated on the excellence and clarity of his presentation in statistical form, of the results obtained in this large series. He should also be commended for the frankness with which he records failures or complications.—Ed.]

Replacement of Femoral Head by Judet or Austin Moore Prosthesis Frank E Stinchfield Bernard Cooperman and Cyril E Shea Jr[5] (New York Orthopaedic Hosp) present a follow up study of 55 patients with the Judet prosthesis and 50 with the Austin Moore prosthesis The follow up period was 1 3 years for 75 patients and 3-5 years for 30 Four types of conditions were treated acute fracture of the neck of the femur avascular necrosis of the femoral head, nonunion of the neck of the femur and osteoarthritis of the hip joint

(5) J Bone & Joint Surg 39 A 1043-1058 October 1957

The criteria for using a prosthesis in treatment of acute intracapsular fractures of the neck of the femur were short life expectancy technical impossibility of stable internal fixation Pauwel's type III fracture in elderly patients pathologic fracture due to metastatic tumors senility parkinsonism and hemiplegia Good results were achieved in 2 of 9 patients with the Judet prosthesis and in 11 of 14 with the Austin Moore prosthesis Better results were observed in the patients with the Austin Moore prosthesis because in acute intracapsular fracture the femoral neck usually undergoes osteoporosis and thus may give way under the Judet prosthesis The incidence of failure with other forms of treatment is highly controversial If the high estimates of failure are accurate there seems to be little doubt that there is a definite place for the femoral head prosthesis in treatment of patients who meet the criteria for replacement

In patients with avascular necrosis in healed fractures of the femoral neck the criteria for using a prosthesis were pain and beginning acetabular osteoarthritis Of 15 patients with a Judet prosthesis 14 had good or excellent results Only 1 had an Austin Moore prosthesis and the result was good Avascular necrosis appears to be the clearest indication for replacement of the femoral head With death of all or part of the femoral head little reliance can be placed on continued support of a Smith Petersen mold nor can hip fusion be attained with any degree of certainty

In patients with nonunion the criteria for surgical replacement of the upper end of the femur were pain and instability Good or excellent results were achieved in 4 of 8 patients with the Judet prosthesis and in 11 of 15 with the Austin Moore prosthesis The latter appears to be the prosthesis of choice in this condition Results in patients with nonunion of a fractured femoral neck serve only to strengthen the general conviction that repair of such nonunion by osteotomy and bone grafting should be performed if the procedure is technically feasible and the femoral head viable.

The chief indication for surgery in patients with osteoarthritis was pain Good or excellent results were obtained in 15 of 23 patients with the Judet prosthesis and in 13 of 20 with the Austin Moore prosthesis Results appear com

parable to those obtained with Smith Petersen molds and femoral osteotomy The decision to use a prosthesis should depend chiefly on the bony anatomy of the hip joint per se and the surgeon s experience. The advantage if any that prostheses have is that the postoperative period of immobilization is much shorter

Prosthetic Replacement and Radioiodine Treatment of Metastatic Thyroid Cancer of Neck of Femur is described by Leo Mayer and Milton Friedman[6]

Woman had partial thyroidectomy at age 25 for a swelling of the thyroid, which proved to be a fetal adenoma. A recurrent thyroid tumor was removed 10 years later She was well until age 41 when she slipped and felt a sudden crack in the region of the left hip. The hip was immobilized in plaster of paris for 3½ months. Thereafter estrogen and testosterone were given. X rays showed early destructive changes in the 3d and 5th lumbar vertebrae and an ununited fracture of the neck of the left femur The left leg was 1 in. shorter than the right, and motion of the left hip was moderately restricted.

The femoral head was replaced by a Judet prosthesis which however subluxated postoperatively In a second operation, a longer prosthesis of Vitallium (Thompson design) was inserted. Even with this prosthesis however a normal relation of the head to the shaft was not secured, and the Thompson prosthesis also subluxated. The tendency to displacement of the two prostheses was difficult to explain until bone sections disclosed a metastatic carcinoma of the thyroid In a third operation a special prosthesis designed to replace not only the head but the entire neck of the femur was inserted and remained in normal position

A tracer dose of 1.7 mc. radioiodine was given A profile study revealed a normal symmetrical uptake over both hips and femora. Although there was no physical evidence that this tumor had an affinity for iodine a therapeutic dose of 51 mc. radioiodine was given. Immediate survey showed no differential uptake but a survey 2 weeks later indicated that the left femoral neck took up 50% of the amount taken up by the residual thyroid gland, whereas the right femur took up only 20% A second therapeutic dose of 38 mc. radioiodine was then given The plaster spica was removed 1 month after the third operat n Soon the patient could walk with a cane X rays showed the Th pson prosthesis in perfect position.

Tracer studi about 12 weeks after the second therapeutic radioiodine dose sh d equal uptake over both femoral necks. Again this negative t ing was discounted on the basis of the histologic appearance and biologic activity of the tumor and a third therapeutic dose of 38 mc. radioiodine was given Under systematic physical therapy the patient continued to gain in strength and walking ability X rays showe l replacement of both the greater and lesser trochanters without evidence of malignancy However 8 months later

(6) Bull. Hosp. Jo t Dis. 17 134-140 October 1956.

pain appeared in the lumbar spine. Tracer study showed increased relative uptake of radioiodine over the lumbar and sacral spine and posterior surfaces of the left and right ilium. X rays revealed extensive destructive involvement of the 3d and 5th lumbar vertebrae. Promptly two more doses of radioiodine were given, resulting in diminished backache and tenderness. After a therapeutic dose of 44 mc., pain disappeared and the patient continued to improve. The back pain recurred after 5 months and though the tracer profile was normal a therapeutic dose of 18 mc. was given.

The patient relapsed after 2 months and became bedridden. Tracer studies showed an extremely high uptake over the lumbar spine. There was further extensive destruction of the 3d and 5th lumbar vertebrae and a suggestive reactivation of the tumor in the area of the lesser trochanter of the left hip A therapeutic dose of 49.2 mc. radioiodine was given. After temporary improvement, the patient gradually weakened and died, about 3½ years after the metastas to the hip was revealed histologically

Radioiodine is of benefit in only 10-15% of thyroid carci nomas Dosage is empiric, depending on clinical judgment of the biology of the tumor and the impact of the drug on the normal hemopoietic system The authors patient had no leukopenia but a moderate secondary anemia

Calculation of Angle of Anteversion by Means of Horizontal Lateral Roentgenography The chief merit of the method, described by Donald J Magilligan[7] (Brooklyn) is that the calculation is done from roentgenograms already made to determine the relation of the femoral head to the acetabulum Thus additional radiation exposure is unnecessary time is saved and the need for extra equipment is obviated The method is as accurate as any of the other three in use.

It must be assumed as a starting point that there is a line called the diacondylar line through the center of both femoral condyles at a right angle to the long axis of the femur and in the coronal plane of the femur (Fig 130 *A*) There is next postulated a point in the proximal portion of the femur at the junction of the shaft and neck. Such a point must be theoretically in the center of this portion of the femur (*B* point *P*) It is assumed that a plane called the diacondylar plane lies on this point and on the diacondylar line This shall be used as a base plane in this discussion (*B*) A second plane the cervical plane (*C*) is then assumed to extend through the long axis of the neck of the femur lengthwise along the femoral shaft. The angle at which the

(7) J Bone & Joint Surg 38-A 1231 1246 December 1956.

parable to those obtained with Smith Petersen molds and femoral osteotomy The decision to use a prosthesis should depend chiefly on the bony anatomy of the hip joint per se and the surgeon's experience The advantage if any, that prostheses have is that the postoperative period of immobilization is much shorter

Prosthetic Replacement and Radioiodine Treatment of Metastatic Thyroid Cancer of Neck of Femur is described by Leo Mayer and Milton Friedman[6]

Woman had partial thyroidectomy at age 25 for a swelling of the thyroid which proved to be a fetal adenoma. A recurrent thyroid tumor was removed 10 years later She was well until age 41 when she slipped and felt a sudden crack in the region of the left hip The hip was immobilized in plaster of paris for 3½ months. Thereafter estrogen and testosterone were given X rays showed early destructive changes in the 3d and 5th lumbar vertebrae and an ununited fracture of the neck of the left femur The left leg was 1 in. shorter than the right, and motion of the left hip was moderately restricted.

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(6) Bull. Hosp. Joint Dis. 17 134-140 October 1956.

cervical plane intersects the diacondylar plane is the true angle of anteversion (*D*)

TECHNIC—Anteroposterior and horizontal lateral roentgenograms are taken in the manner described by Laage *et al* The position of the patient and the extremities remains constant. When the anteroposterior view is being made the head of the x ray tube is centered as accurately as possible over the hip joint. Every effort is made to hold the femur parallel to the table and in neutral rotation Since the diacondylar plane is then parallel to the table it is also parallel to a cassette placed on the table under the hip joint. An anteroposterior roentgenogram made in this position reveals a projected cervicofemoral angle. This is an almost universally routine manner of

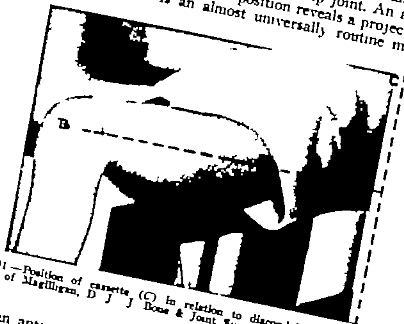


Fig. 131—Position of cassette (C) in relation to diacondylar plane (line B) (Courtesy of Magilligan, D J J Bone & Joint Surg 38-A 1231 1246 December 1956.)

making an anteroposterior roentgenogram and requires no special demonstration.

For the horizontal lateral roentgenogram the cassette is held against the lateral side of the thigh and trunk, and the head of the x ray tube is placed between the thighs If it is to be of value in calculating the angle of anteversion, this view must be made with the face of the cassette at a right angle to the diacondylar plane, i.e. at a right angle to the table (Fig 131) It must also be parallel to the long axis of the femoral neck, which is first determined from the anteroposterior roentgenogram. The position of the trunk is not changed. The head of the tube is brought down between the thighs to the level required for the horizontal lateral roentgenogram.

The cassette is placed in a holder so constructed that a cassette held in its slots is perpendicular to the tube The holder is placed in position on the table so that the edge of the cassette rests against the patient s flank. At times it may be necessary to vary slightly the degree of abduction of the femur This does not affect the calculation

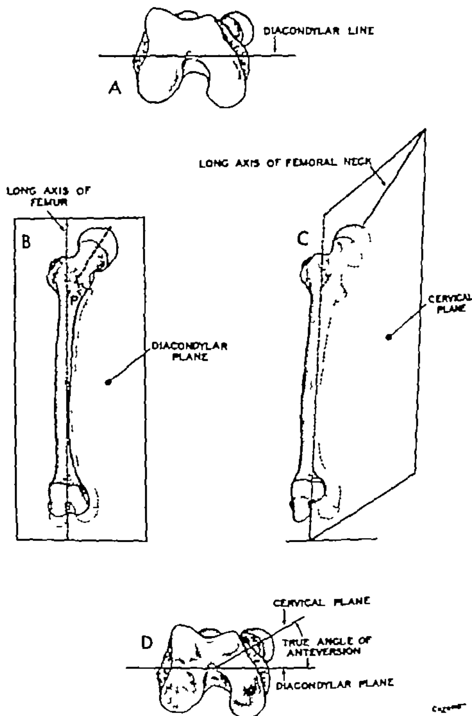


Fig 130 — Portrayal of definition of angle of anteversion. (Courtesy of Magilligan, D J : J Bone & Joint Surg 38-A 1231-1246 December 1956.)

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TECHNIC —Anteroposterior and horizontal lateral roentgenograms are taken in the manner described by Laage *et al* The position of the patient and the extremities remains constant. When the anteroposterior view is being made, the head of the x ray tube is centered as accurately as possible over the hip joint Every effort is made to hold the femur parallel to the table and in neutral rotation. Since the diacondylar plane is then parallel to the table it is also parallel to a cassette placed on the table under the hip joint. An anteroposterior roentgenogram made in this position reveals a projected cervicofemoral angle. This is an almost universally routine manner of

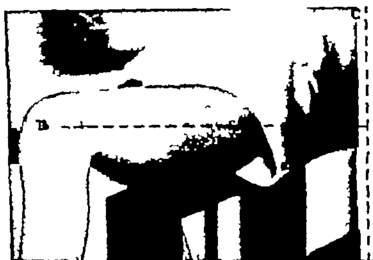


Fig. 131 —Position of cassette (*C*) in relation to diacondylar plane (line *B*) (Courtesy of Magilligan, D J J Bone & Joint Surg. 38-A:1231 1246, December 1956.)

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since the mathematical formula is based entirely on lines and planes contained in the femur On a roentgenogram made according to this technic there will be shown a projected angle of anteversion, designated angle β (Fig 132) When the values of these two angles are

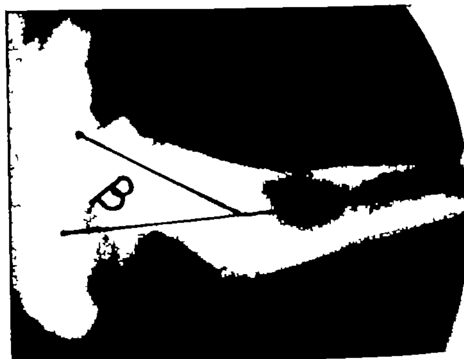


Fig 132.—Projected angle of anteversion (β) (Courtesy of Magilligan, D J J Bone & Joint Surg 38-A:1231 1246, December 1956.)

known, it is possible to calculate from them the value of the true angle of anteversion.

Where Do We Stand on Hip Prosthesis? According to J E. M Thomson[8] (Lincoln Nebr Orthopaedic and Rehabilitation Center) hip replacement prosthesis has a definite but limited place in treatment of painful disabilities of the hip The chief causes of failure are improper selection of patients inadequate pre and postoperative measures anesthetic difficulties lack of experience and knowledge in selection of the type of prosthesis and of mechanical principles involved in proper seating lack of proper tools or of know how in using them and failure in aseptic technic.

Prosthesis replacement should be regarded as a procedure of last resort—a salvage operation on a patient physically mentally and economically worth salvaging Its field of use-

(8) Indian J Surg 18 481-486 December 1956.

fulness is limited to fresh fractures of the neck in patients over age 70 nonunion fractures of the femur in patients over 60 aseptic necrosis of the hip in patients over 60 with extensive changes in the head and neck and osteoarthritis in elderly persons with extensive degenerative changes in the head and neck and intolerable pain and instability When contemplating operative procedures for osteoarthritis other measures should be considered for prosthesis replacement is mutilating and requires sacrifice of vital bony structure

Replacement prosthesis arthroplasty is a more satisfactory operation for older persons who do not demand so much of the prosthesis No matter what type of prosthesis is used, if the patient lives long enough and uses it hard enough resorption instability discomfort and disability recur Most old persons recognize their physical limitations and with sufficient protection and discretion are able to make the prosthesis last them fairly well throughout life

Pseudarthrosis of Hip Joint is the operation of choice in failed arthroplasties of the Judet or Smith Petersen types according to R. G Taylor[9] (Oxford England) It is the best method available for treatment of ankylosing spondylitis and for patients over age 65 with disabling osteoarthritis This procedure successfully relieves pain A remarkable degree of stability is preserved far more than the nature and extent of the operation would indicate. Movement is restored for sitting and walking thereby eliminating the excessive strain thrown by a stiff hip on the lumbar spine and knee Of 90 patients with a long follow up 83 obtained good and 7 poor results

METHOD —The anterior lateral or posterior approach can be used. Damage to the nerve supply of the muscles round the hip must be avoided. The anterior and upper rim of the acetabulum are carefully removed to aid dislocation of the femoral head and to avoid bony contact between the femoral stump and the acetabular margin during walking Neglect of acetabular beveling may demand revision of the operation to control pain on weight bearing

Postoperatively the limb is suspended from a beam in a Thomas splint with a Pearson knee flexion attachment. The knee rests in 30-degree flexion. Traction is maintained throughout splintage. The patient lies flat at night to prevent flexion deformity but sits up freely during the day Lateral rotation should be avoided the limb

(9) Proc. Roy Soc. Med. 49:963-964 November 1956.

should rest in the neutral position Two weeks after operation, quadriceps exercises with assisted active flexion and extension of the limb are begun The Thomas splint is retained for 4 weeks then replaced by Russell traction with use of pulleys as advocated by Dommisse and Nangle This allows for massage and for graduated active and passive exercises of the hip and knee. After 6 weeks the patient is encouraged to stand up on the sound leg a week later walking in a bucket top caliper with crutches is begun. Ultimately the patient learns to walk with one stick held in the opposite hand. The patient is advised to wear the caliper for the first 6 months, after which most prefer to discard it.

Principles of Hip Socket Arthroplasty are presented by Marshall R Urist[1] (Univ of California Los Angeles) The surgical procedure recommended consists of posterolateral approach to obtain extensive exposure of the acetabulum (Fig 133) capsulectomy and synovectomy to relieve pain cheilotomy to remove intra-articular obstacles in the range of motion section of the musculotendinous envelope to relieve periarticular adhesions and implantation of a noncorrosive (Vitallium) hip socket (Fig 134) Special surgical instruments have been designed for implanting the socket The hip socket is a self sustaining lining for the acetabulum and is stable enough to allow motion immediately after operation The socket is open at the inferior margin to permit regeneration of a structure resembling the ligamentum teres and mucin forming synovial cells inside the joint. It encloses only half the head of the femur and thereby permits a wide range of motion

To restore painless motion to an ankylosed joint hip socket arthroplasty initiates a series of proliferative connective tissue reactions similar to those seen after mold arthroplasty These reactions in order of their appearance, are fibroplasia and fibrochondroplasia precipitation of ground substance and formation of fibrinoid mucin and mucinous fluid chondrogenesis osteogenesis regression of scar and periarticular ossification

Of the 48 patients with hip socket arthroplasties 5 showed complications and had revision arthrodesis or resection operations 6-18 months after arthroplasty Among the first 12 hip socket arthroplasties (2 bilateral) examined between 2

(1) J Bone & Joint Surg 39-A 786-810 July 1957

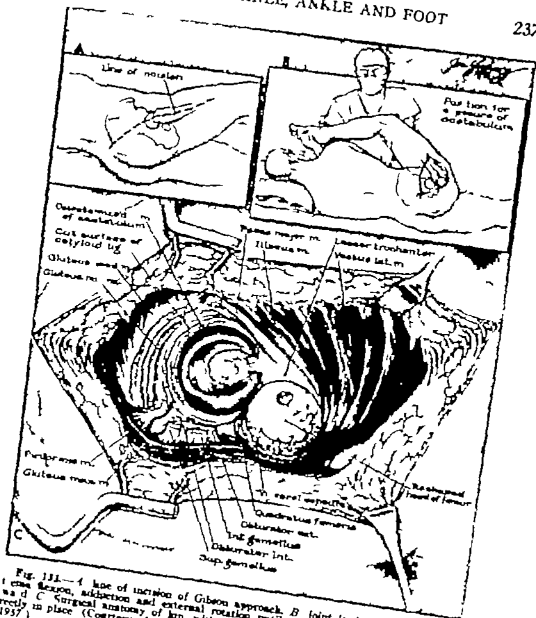


Fig. 111.—*A* line of incision of Gibson approach. *B* Joint is disarticulated by extension flexion, adduction and external rotation until medial aspect of foot faces upward. *C* Surgical anatomy of hip with head of femur reshaped and hip socket correctly in place (Courtesy J Urist, M R. J Bone & Joint Surg. 39-A 786-810 July 1957)

and 3 years after the operation results were fair in 1 good in 1 and excellent in 10 The patients had less pain increase of range of motion and a stable joint. Compared with other surgical methods there was a remarkably free range of rotation with flexion One patient who had had an unsuccessful Vitallium mold arthroplasty obtained a good result with

should rest in the neutral position Two weeks after operation, quadriceps exercises with assisted active flexion and extension of the limb are begun The Thomas splint is retained for 4 weeks, then replaced by Russell traction with use of pulleys as advocated by Dommisse and Nangle This allows for massage and for graduated active and passive exercises of the hip and knee. After 6 weeks the patient is encouraged to stand up on the sound leg a week later walking in a bucket top caliper with crutches is begun Ultimately the patient learns to walk with one stick held in the opposite hand. The patient is advised to wear the caliper for the first 6 months after which most prefer to discard it.

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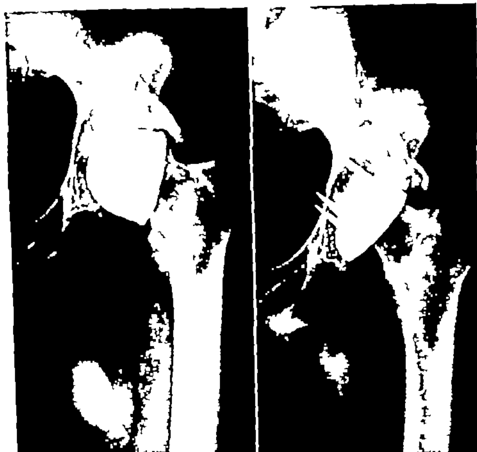


Fig. 135 (left) —Unsuccessful Vitallium mold arthroplasty 2 years after operation.
Fig. 136 (right) —About 2 years after hip socket arthroplasty Tip of trochanter was removed and tendon of glutaeus medius muscle transplanted to externus tubercle of femur
(Courtesy of Urist, M. R. J Bone & Joint Surg. 39-A.786-810, July 1957)

edly deformed or destroyed were disappointing. The technic developed and recommended by Urist is the result of careful scientific study *The end* result study is significant. The surgeon who is contemplating an acetabular revision or reconstruction will be well advised if he reviews carefully this presentation by Urist.—Ed.]

Total Replacement of Knee Joint by Prosthesis was performed by W Russell MacAusland[2] (Boston) in a woman, aged 45 who for 2 years had been a bedridden helpless invalid. Previously she had a replacement operation on both elbows At follow up examinations no pain was experienced in any of the restored joints X rays of the right knee were taken 10 months after operative replacement (Fig 137) The

(2) Surg., Gynec. & Obst. 104.579 583 May 1957

the procedure of hip socket arthroplasty (Figs 135 and 136)

In congenital dislocation of the hip, paralytic conditions fresh trauma, active bone infection or neoplasm hip socket arthroplasty should not be done. Active rheumatoid arthritis and Marie Strümpell disease are not favorable for performance of arthroplasty The operation is not suitable in de-

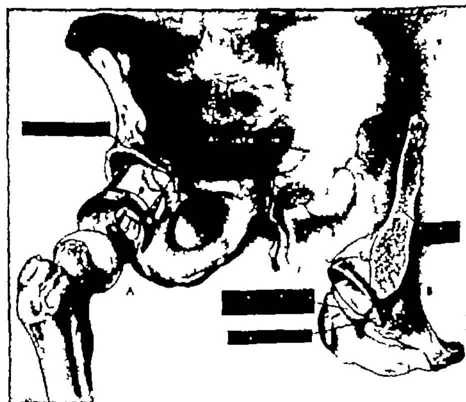


Fig 134 —*A* hip joint and socket, showing anatomic relations of pelvis, arcuate line, sacrum, sacroiliac joint and lumbosacral vertebrae. *B* hip socket in place in acetabulum viewed from above through line of section. Cortex of neck of ilium is extremely dense and thick where it crosses arcuate line. (Courtesy of Urist, M. R. J Bone & Joint Surg. 39-A 786-810 July 1957)

generative joint disease resulting from acetabular dysplasia anteversion of the femoral neck and conditions causing eccentric excursions of the femoral head on the pelvis when the joint is in flexion The hip socket should be removed and replaced by bone grafts and internal fixation should be inserted to obtain arthrodesis in all instances in which the joint does not move freely at the conclusion of the operation.

► [Until recently attempts to replace an acetabulum that had been mark



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(2) Surg., Gynec. & Obst. 104.579-583 May 1957

patient can easily flex the joint to 80 degrees from the extended position and voluntarily extend the leg again to 180 degrees (Fig 138) She is more comfortable in the sitting position and can stand on the extremity with complete stability of the joint but the drop foot prevents the heel from



Fig 137 Lateral x ray film 10 months after total replacement of knee joint, showing prosthesis in place (Courtesy of MacAusland, W R. Surg., Gynec. & Obst. 104 579 583 May 195)

touching the floor Walking is impossible because of the Achilles tendon contracture and the stiff knee on the opposite side

The prosthesis is made entirely of Vitallium Two parts, a femoral and a tibial component lock together by a rod and bolt to form a hinge joint This joint mechanically stable anteroposteriorly and laterally limits extension to

180 degrees and permits flexion to 10 degrees beyond the right angle Each part is equipped with a stem for insertion into the medullary cavity In addition provision is made to insure stability by means of flanges and teeth

TECHNIC.—Before the operation, the patient must be instructed in contraction exercise of the extensor muscle. The extremity from the ankle to the groin is prepared. An Esmarch bandage is used as a tourniquet. A longitudinal incision is made slightly to the medial side of the extremity starting about 5 in. above the patella, passing

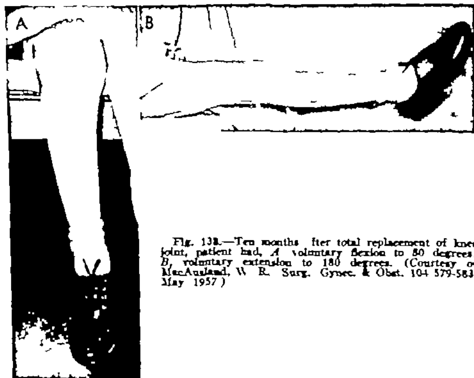


Fig. 138.—Ten months after total replacement of knee joint, patient had, *A* voluntary flexion to 80 degrees, *B*, voluntary extension to 180 degrees. (Courtesy of MacAusland, W R. Surg. Gynec. & Obst. 104 579-583 May 1957)

just slightly to the inner margin of the patella and terminating well below the tibial tubercle. The skin flaps are reflected to their respective sides. In absence of patellofemoral ankylosis, the patella could be retained because the prosthesis is provided with a surface to receive it. To obtain better exposure of the lower end of the femur a 2 in. incision is made in the quadriceps tendon, following the line of the skin incision. The patellar tendon is retracted to the outer side without disturbing its continuity The capsule is incised and both flaps are reflected to expose the upper tibial surface and the lower femoral extremity for a distance of about 5 in. Blunt dissection is used as much as possible in this process to preserve the periosteal structure intact.

After blunt dissectors have been introduced to protect the popliteal region, a transection of the femur is made with a saw

above the joint line A half inch of bone is removed from the tibial surface. All bone spicules are excised The joint is now flexed. The femoral section of the prosthesis is inserted by driving its stem and flanges into the medullary cavity and its teeth into the cortical bone. The tibial component then is introduced. The two parts of the prosthesis are fitted together and the rod is inserted and fixed tightly with the bolts. The wound is closed in layers A voluminous dressing is applied with slight compression Gentle contraction exercises of the quadriceps are begun on the 3d postoperative day Within a few days after the stitches have been removed the joint is carefully flexed Gradual progress is made under supervision of a physiotherapist in developing the power of the extensor muscle by exercises and in active movement of the new joint.

Arthroplasty of Knee Using Endoprosthesis Borje Walldius[3] (Karolinska Inst Stockholm) presents a new method,

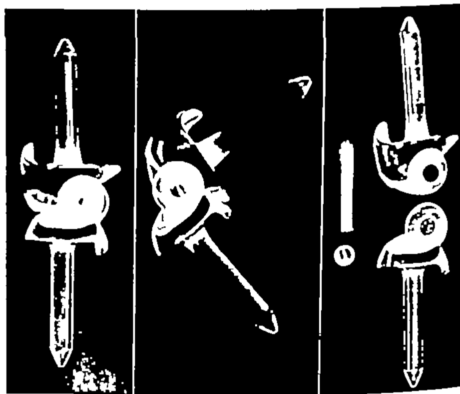


Fig 139—Lateral views of prosthesis. (Courtesy of Walldius, B. Acta orthop. scandinav., supp 24 1957)

consisting of resection of the joint and insertion of a whole artificial joint This acrylic resin prosthesis is constructed as a hinge joint and has a femoral and tibial part joined together by a stainless steel rod (Fig 139) Its range of move-

(3) Acta orthop. scandinav supp. 24 1957

ment is 185 to 90 degrees Fixation in the femur and tibia is done with medullary pins and lips in the prosthesis The prosthesis takes over the functions of the collateral and



Fig 140 (left) —Before operation.
Fig 141 (right) —Three months after arthroplasty of right knee. (Courtesy of Walldius, B Acta orthop. scandinav., supp. 24 1957)

cruciate ligaments so these ligaments can be sacrificed at operation

Arthroplasty using the endoprosthesis was used in 26 patients with operation on 32 knees Two patients died 1 of pulmonary embolism and 1 of septicemia. Complications necessitated subsequent arthrodesis in 4 knees and amputation of the leg in 2 patients Among the other 24 knees results were considered excellent in 75% Freedom from pain average active mobility of 84 degrees full stability and regained or improved walking ability (Figs 140 and 141)

were achieved. The results compare favorably with those obtained in about 50% of knees treated with the surgical technic hitherto used (interposition with fascia lata)

Follow up x ray examination showed the prosthesis to be surrounded by a zone of sclerosed bone at the resected surfaces and by small osteophytes which contributed to its fixation (Fig 142) No reactions were observed in the bone tissue to indicate that the prosthesis would become loosened

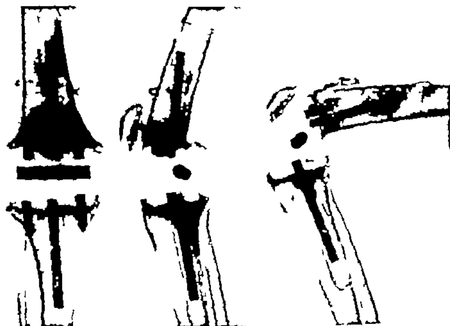


Fig 142.—X rays 17 months after arthroplasty of right knee. (Courtesy of Walldius, B Acta orthop. scandinav supp 24 1957)

later It is too early to know whether results are permanent as the longest observation period was under 5 years

► [Arthrodesis of a single painful, unstable or severely diseased knee joint is to be preferred to any arthroplasty but if both knees are involved, motion should be preserved in at least one. The results demonstrated by Walldius appear to be exceptionally good.—Ed.]

Patellar Malacia Clinical Study was conducted by Don H O Donoghue[4] on 350 patients In most malacia occurred relatively young As the episodes of locking increased there was coincident increase in the degree of patellar malacia This is particularly dramatic if the one third of the cases which never lock are eliminated As a corollary it must be admitted that since there is a basic one third of the patients

(4) Bull. Hosp Joint Dis 17 1 19 April, 1957

that has never had any locking locking in these could not be a factor in their malacia However there is an almost exact correlation between the number of lockings and the degree of malacia in the other two thirds of the patients The normal mechanism of the knee should not be allowed to be disturbed. Repeated lockings of the knee are of extreme importance A patient should not be permitted to continue month after month with catching or locking simply because it can be shaken off and not be a serious handicap at the moment

The age of the patient is not the most important factor in determining the result of knee surgery Of more importance are duration of symptoms degree of malacia and number of lockings If surgery is necessary for an intrinsic condition of the knee it should be done at once The degree of patellar malacia is a true index of the result to be expected in any given patient and is therefore of prime prognostic importance.

End Result Study of Patellectomy is presented by A E DeNio (Long Beach Calif) and O C Hudson[5] (Hempstead N Y) Patellectomy is a good surgical procedure, required most frequently for treatment of chondromalacia and traumatic injuries to the knee. The defect made by excision of the patella must be repaired with rectus tendon After-care is the most important step in therapy and patient and physician must co-operate to obtain a good end result. Active quadriceps muscle exercises are started on the day of operation In a "good outcome there must be complete extension to 180 degrees against gravity with a strong quadriceps muscle flexion must be to 90 degrees or more and the patient should have no complaints With these criteria, the functional end result was good in 44 of 58 cases followed 2-6 years postoperatively On exclusion of acute fracture cases improvement was noted in 42 of 44 cases after surgery

Internal Derangement of Knee Joint Including Ligamentous Tears is discussed by John R. Norcross[6] (Northwestern Univ) Simple sprain of the knee follows a twisting injury It is characterized by pain muscle spasm limitation of mo-

(5) Am. J Surg. 94:62-64 July, 1957
(6) S Clin. North America 37:91 102, February 1957

tion and gradual swelling of the joint. An effusion usually develops by 6 hours If swelling occurs rapidly, tearing of the synovial vessels with resultant hemarthrosis must be considered

Semilunar cartilage tears result from a weight bearing injury with the knee in flexion Many types of tears may occur The most common lesion involves the anterior horn of the medial semilunar cartilage Transverse and oblique tears may occur in the midportion of the semilunar cartilage and in the posterior horn The following technic is most effective for reduction of a torn cartilage

TECHNIC.—With the patient supine, the physician grasps the involved extremity with both hands one just above the ankle and the other just above the knee The patient's knee is flexed to an acute angle For a medial tear the physician externally rotates the tibia on the femur and at the same time pushes the flexed knee into abduction. Then the patient is instructed forcibly to kick the foot out straight thus extending the knee. If the maneuver is successful, a definite click may be heard and the knee may be completely extended. For a lateral tear the procedure is reversed.

Surgical arthrotomy of the knee is indicated if closed reduction fails to unlock the knee if there is a history of repeated episodes of disability or if the initial lesion presents all the signs and symptoms of a classic bucket handle tear

An attempt to suture a torn cruciate ligament usually fails Conservative treatment consists of immobilization in a long leg plaster cast with the knee slightly flexed For a tear of the anterior ligament the tibia is pushed backward on the femur and for a tear of the posterior ligament the tibia is pulled forward in relation to the femur Such immobilization is necessary for at least 3 months During this time quadriceps tightening must be done every hour

In old neglected cases of rupture of the internal collateral ligament trying active non weight bearing exercises of the quadriceps is justified If after thorough trial of conservatism the knee is still relaxed operation may be indicated. One of the best methods of reconstruction uses the semitendinosus tendon A groove is cut in the medial femoral condyle and the tendon is buried in this groove Its normal insertion to the tibia is left intact The frayed remnants of the original ligament are sutured to the tendon A plaster cast for 6 weeks is all the immobilization necessary

One of the commonest causes of loose bodies in the knee

is trauma which produces an osteochondritis of a small, well-circumscribed area on the articular surface of the femur Occasionally this condition is observable by x ray Treatment consists of surgical removal Osteochondromatosis results from the formation of many osteocartilaginous bodies in the joint and arising from the synovial membrane. As a rule the articular cartilage is not involved Treatment is surgical excision of the synovia and removal of all loose bodies

Diagnosis of Posterior Lesions of Medial Meniscus Description of New Test is presented by Harold M Childress[7] (Jamestown N Y) Posterior medial meniscal lesions are often overlooked Neglect may allow development of recurrent synovitis with subsequent atrophy of the quadriceps muscle, joint instability traumatic arthritis and occasionally popliteal cysts Review of the histories of 42 patients revealed that most had done work involving squatting or crouching down

The duck waddle test simulates the motions that tend to produce the injury If excess synovial fluid is present the joint is aspirated before testing The patient assumes a squatting position and waddles back and forth and moves from side to side before arising A positive sign is indicated if complete knee flexion cannot be obtained because of pain at the posterior joint or by clicking at the posteromedial portion of the joint usually followed by discomfort The test is rather strenuous and cannot be performed by some patients, including the senile obese and arthritic.

Five tests have been valuable in indicating posterior medial meniscal lesions (1) duck waddle test—positive in 32 of 35 patients (2) pressure tenderness at the medial or posteromedial joint line with the knee in hyperextension and bearing weight with or without localized mild to moderate bulging—present in 37 of 42 patients (3) pain on forceful adduction of the extended knee but none on abduction—present in 31 of 42 patients (4) McMurray's sign—positive in 28 of 42 patients (5) Apley's sign—positive in 26 of 42 patients.

There are no pathognomonic signs of the lesion Diagnosis is based on careful evaluation of history and interpret-

(7) Am J Surg. 93:782-787 May 1957

of testing procedures The most significant historical information is that of previous habitual weight bearing deep knee flexion followed by recurrent increased fluid in the joint a feeling of instability at the joint and vague discomfort at the posteromedial area of the articulation

Discoid Lateral Meniscus of Knee Joint Nature, Mechanism and Operative Treatment. Emanuel B Kaplan[8] (Co-

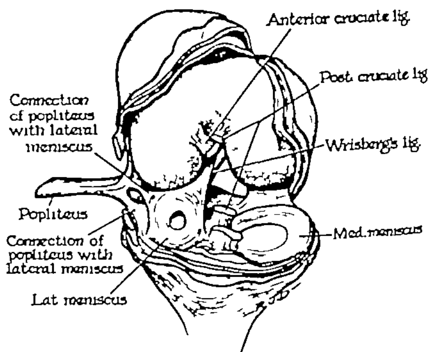


Fig 143 —Right knee of chimpanzee with femur and tibia in flexion, showing relation of meniscofemoral ligament to lateral meniscus. Posterior part of lateral meniscus completely detached from lateral tibial spine. Only visible attachments are those to meniscofemoral ligament coronoid ligament and popliteus tendon. Posterior attachment of medial meniscus is firm. (Courtesy of Kaplan, E. B.: J Bone & Joint Surg 39 A 77-87 January 1957)

lumbia Univ) investigated the clinical entity known as discoid lateral meniscus to determine its cause and to explain the mechanism of the click often observed during flexion and extension of the knee joint Since treatment consists in removing the discoid meniscus an attempt also was made to find a more direct method for removal that would be more consistent with the surgical anatomy of this condition In a recently reported embryologic study of the menisci the author established that in no stage of development from

(8) J Bone & Joint Surg 39 A 77-87 January 1957

the earliest phase to birth does the lateral meniscus appear in the form of a disk. In a series of comparative-anatomy dissections none of the animals available representing mammals birds amphibians and reptiles had a lateral or medial meniscus resembling a disk.

Observations at operation showed that in persons with discoid menisci there is no attachment of the posterior horn to the tibial plateau (Fig 143) Instead there is a continuous Wrisberg ligament (meniscofemoral ligament) that forms a link between the posterior horn of the meniscus and the medial condyle of the femur This is similar to the normal arrangement observed in all animals except man On the basis of these observations it was concluded that patients with discoid menisci are born with a normal lateral meniscus as far as form is concerned, but with an anatomic variation that consists in the posterior horn of the lateral meniscus not being attached to the tibial plateau In these persons as in all animals but man the meniscofemoral ligament joins the meniscus to the medial condyle of the femur This anatomic variation does not permit the normal limitation of movements of the lateral meniscus that is required by the normal range of motion of the human knee joint The discoid form develops gradually after birth and results from abnormal motion of the lateral meniscus The hypertrophied meniscus actually varies in shape but has been fancifully called discoid.

Removal of the discoid meniscus should be performed through two incisions one between the biceps femoris and the lateral collateral ligament and the other between the patellar ligament and the iliotibial band The principal part of the operation consists in division of Wrisberg s ligament to free the meniscus from behind. In difficult cases the incision should be placed behind the biceps tendon and if proper precautions are taken there should be no hesitancy in dividing the belly of the lateral gastrocnemius Once Wrisberg s ligament is divided it is simple to separate the meniscus from the popliteus tendon coronary ligament and lateral collateral ligament

Long Term Results in Bucket Handle Acetabuloplasty are reported by I William Nachlas[9] (Baltimore) This pro-

(9) J Bone & Joint Surg 39-A 309-316, April, 1957

cedure was developed to convert the deformed acetabulum into a hemispheric socket with adequate depth A hemisphere can be projected by swinging a half circle on its ends through an arc of 180 degrees This concept can be applied to the acetabulum If the rim of the upper half of the acetabulum is cut free except at its anterior and posterior ends,

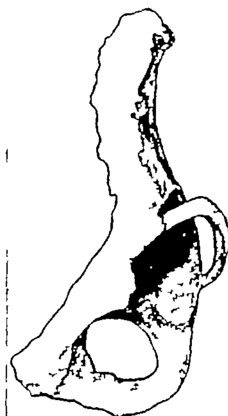


Fig. 144 —Hip after rim of upper portion of acetabulum has been swung out like a bucket handle. (Courtesy of Nachlas, L W: J Bone & Joint Surg 39-A 309 316, April, 1957.)

a half circle of bone can be swung out like the handle of a bucket (Fig 144) The gap that is left can be filled by a graft from the iliac crest As the circulation of the live bone in this area is good adequate callus to heal the operative fracture may be expected

At operation, the femoral head is placed deep in the acetabulum where it is held by abduction of the limb The rim of the acetabulum is cut and is swung out as far as indi

cated after which a bone graft is placed in the gap A plaster-of paris spica applied with the limb in abduction is used for immobilization during healing The femoral head serves as a mold for the newly formed callus

Since the operation is a reconstruction of the acetabulum the femoral head must first be brought down to the level of the acetabular socket which may require earlier use of traction or performance of a relaxing operation If this prerequisite is met the operation is suitable for congenital dislocation of the hip and for other types of chronic dislocation The conditions of the group of patients on whom this procedure was originally used included poliomyelitic dislocation wandering acetabulum and congenital dislocation.

Follow up after 14-21 years on 7 patients with bucket handle acetabuloplasty revealed that hip stability was maintained in every patient Pain was negligible except in the patient with generalized rheumatoid arthritis Range of motion was good in all Limp was noted in 3 Shortening of the affected limb was noted in nearly every patient, in 3 by as much as 1 in X rays revealed that in all patients the femoral head was in the socket and that the normal anatomic pattern of the acetabulum had usually not been restored Most of the acetabula were higher than those on the unaffected side

► [Most of these were 20-year end results. The x ray illustrations show osteoarthritis and thinning of the cartilage space. Perhaps this procedure should be confined to young patients. For the older patient, a Shantz type of subtrochanteric osteotomy has provided very satisfactory results.—Ed.]

Tibia Vara Osteochondrosis Deformans Tibiae according to A. Evensen and Johs Steffensen[1] (Gjövik, Norway) is a disturbance of the growth of the medial part of the upper end of the tibia and involves the epiphysis epiphysial cartilage and surrounding part of the metaphysis (Figs 145 and 146) Similar changes in the normal growth have also been demonstrated in the lower end of the femur and tibia

Because of this disturbance of growth the medial part of the epiphysis does not develop as it should but becomes more or less wedge shaped The structure of the bone appears to be normal The epiphysial line seems to be normal

(1) Acta orthop. scandinav 26.200-210 1957

in the lateral part corresponding to the normal part of the epiphysial line but medially it is usually broader and more irregular The metaphysis shows a more or less pronounced beaklike prominence medially The metaphysial bone shows an irregular structure often with small cartilage islands in it and with small osseous islands near the surface

Microscopic studies revealed that the most characteristic feature in the epiphysial line and the prominent part of the

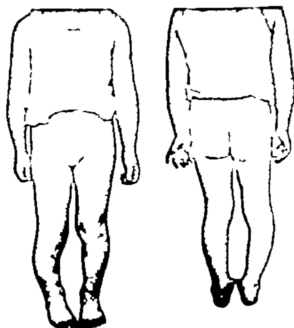


Fig 145 —Typical bowlegs, with marked varus position of right tibia. Bowing is chiefly in epi- a d metaphysis, and medial condyle of tibia is prominent. (Courtesy of Evensen A and Steffensen, J Acta orthop scandinav 26 200-210, 1957)

metaphysis are islands of cartilage cells which show a stronger tendency for growth than the topography should demand The assemblages of cartilage cells are irregular in distribution not columnar In some places cartilage with very few cell but with great calcium deposits is noted whereas other places show softening and invasion of granulation tissue

It seems to be true that the illness is more usual in girls than in boys and often the children are fat and overweight.

Until the progre of the disease has stopped the patient should be observed and the deformity increasingly corrected



Fig. 146.—Distal metaphysis of femur and upper metaphysis of tibia on both sides bowed somewhat in medial direction, causing pronounced varus deformity at knee regions. Lower epiphysis of femur and upper epiphysis of tibia are less developed in medial than in lateral half, and medial parts of corresponding metaphyses are formed as beaklike prominences. No signs of rickets. (Courtesy of Evensen, A., and Steffensen, J Acta orthop scandinav 26:200-210 1957)

by splint or plaster cast. An arthrography of the knee is suggested before operation is decided on Surgery is not indicated when a cartilaginous medial condyle is lacking

Ainhum (Dactylosis Spontanea) Report of Case is presented by Martin Lloyd Norton Angelo M Sala and Martin Elliot Silverstein[2] (New York Med. College) The condition is identified with pseudofibrous band formation about the digit and with constriction rarefaction and pointing of the distal phalangeal segment on x ray examination It eventuates in spontaneous bloodless amputation A characteristic deep encircling groove or furrow at the level of the digitoplantar fold of the little toe is almost pathognomonic of the disease The skin becomes hyperkeratotic, and the walls of the blood vessels may show an endarteritis There is usually

(2) A.M.A. Arch. Surg. 75 473-478 September 1957

little pain unless secondary infection supervenes Ainhum must be differentiated from leprosy scleroderma, cicatrix formation and atypical keratoderma

Man 43 was hospitalized for discomfort on walking Onset had been gradual and painless The distal extremity of the 5th right toe was enlarged and felt doughy on palpation On the flexor surface there was a constriction of the digitoplantar fold, producing the typical deformity of dactylosis spontanea. There was no gross evidence of gangrene. The overlying skin appeared wrinkled. Epidermophytosis was present in both feet. Nontender hard, movable inguinal nodes were present bilaterally X rays revealed pointing in the middle third of the proximal phalanx of the right 5th toe, with constriction of the soft tissues at this point. Because of the difficulty in walking the digit was amputated

Histopathologic examination of the specimen revealed fibrosis of the dermis and deeper tissues with marked atrophy of the bone between the indentations of the skin. The epidermis was markedly hyperkeratotic, with a normal appearing basal layer The corium at the site of constriction was almost without papillae. At the margin of the ring there was dense infiltration of the corium with round cells. Away from the site of constriction the papillae were elongated and narrow The vessels and nerves were normal The salient histologic features were hyperkeratosis of the epidermis fibrosis and chronic inflammation of the dermis fibrosis of the corium and simple bone atrophy

Solitary Cyst of Os Calcis in Adults and Children Report of Eight Cases Lloyd B Kingsbery[3] (La Lima Honduras, C.A) describes 8 patients (4 children) with solitary or unicameral cyst of the os calcis Two patients were treated surgically

The cause of this condition is little understood. A congenital factor and repeated trauma are suggested as possibilities since they often accompany the cysts (Fig 147) Most of the cysts were diagnosed incidentally by x rays taken for other reasons Usually there were no symptoms referable to the cyst Blood calcium phosphorus and alkaline phosphatase determinations were essentially normal Biopsy revealed only simple cyst and served essentially to rule out a number of other lesions Differential diagnosis should consider giant cell tumor Brodie s abscess various malignant bone lesions with cystic changes fibrous dysplasia of bone osteitis fibrosa and enchondroma and gumma of bone.

In children observation until adult bone has developed is probably the best management. When an adult is operated

(3) J Internat. Coll. Surgeons 27 83-91 January 1957



Fig. 147.—Cyst formation of both os calces, with macrodactylism. (Courtesy of Kingsbery L. B. J Internat. Coll. Surgeons 27:83-91 January 1957.)

on the cyst wall should be thoroughly curetted and the entire bony cavity packed with cancellous bone chips

Cysts of Os Calcis These lesions probably occur more often than indicated by the 22 cases reported in the literature William W Ayres and Bruce M Cameron[4] (US Naval Hosp Yokosuka Japan) observed 6 cases during 9 years (4 of which are reported in the article) and 13 are recorded at the Armed Forces Institute of Pathology These cysts have considerable military significance because they may be expected to occur in active young men undergoing rigorous physical activity during military training often without a history of antecedent or remote trauma Symptoms may be absent or pain may be noted in the heel

The diagnostic x ray appearance is that of a well-defined trabeculated unicameral solitary cyst in the lateroinferior portion of the anterior half of the os calcis (Fig 148) At operation a yellow fluid escapes revealing a cyst that is

(4) U.S. Armed Forces M J 8 1102 1117 August, 1957

partially filled with soft yellow brown tissue Histologically this tissue shows organizing hemorrhage often associated with massive deposition of cholesterol crystals (Fig 149)



Fig 148 (left) —Preoperative x-ray appearance of cyst.
Fig 149 (right) —Cholesterol clefts in fibrous stroma. Lesion is not encapsulated but fades into normal fatty marrow; reduced from X85
(Courtesy of Ayres, W W., and Cameron, B M U S Armed Forces M. J 8:1102 1117 August, 1957)

The treatment of choice curettage and packing with bone chips usually results in cure within 4 months

Hemorrhage into the bone secondary to traumatic intra cancellous fracture is believed to be the cause of the cyst.

Heel Spur (Calcaneal Spur) is the result of a chain of events of mechanical origin The plantar fascia functions as a bowstring for the entire plantar surface of the foot. Thus any excess strain on the longitudinal arch exerts a maximum pull or strain at the acute angle of its origin at the anterior lip of the tuberosity of the calcaneus "Weak foot" and overweight which alter the pitch of the calcaneus are important factors in producing excess strain Over a long period this produces a low-grade inflammatory process at the point of origin of the fascia resulting in secondary proliferation ultimately forming the spur

The principal symptom is severe pain in the entire plantar surface of the heel which is aggravated by weight bearing becoming progressively worse and often incapacitating Some heel spurs are symptomless because the angle of growth is such that the spur does not become a weight bearing point These need no attention Most of the fully

putees with diabetes showed the highest incidence of chronic onset and most frequently had below the-knee amputation. Most below the knee amputees showed chronic onset of occlusion before amputation (Fig 151) Of 24 below the knee amputees with acute onset 14 had serious wound com plications

Toe amputations were successful in patients with diabetes in whom the lesions were confined to the toes and were caused primarily by infection or neurotrophic changes. As

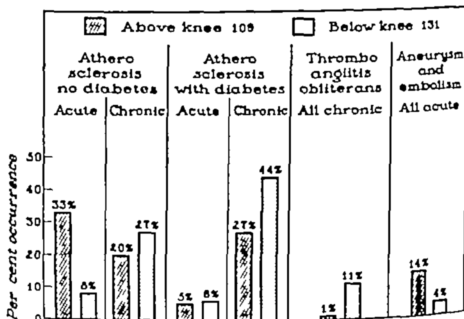


Fig. 150 —Amputations above and below knee according to onset of ischemia, excluding 5 reamputations. (Courtesy of Kelly P J., and James, J M.: J Bone & Joint Surg 39-A.883-891 July 1957)

ischemia became more evident success was less certain. Healing of lesions in patients with atherosclerosis without diabetes was infrequent when amputation was confined to the toe In thromboangiitis obliterans considerable success was note

There were 15 postoperative deaths among the 323 amputees 4 occurred among the 131 below the-knee amputees 10 among the 114 above the-knee amputees and 1 among the 78 toe amputees The average patient who had above-the-knee amputation was older and in poorer general condition than the average patient with below the-knee amputation

Some of the broad considerations in determining whether an amputation should be performed below the knee are the following (1) History of slow onset of the disease process favors amputation below the knee. (2) Presence of a pal pable femoral pulse is desirable. Absence of femoral pulse with history of recent sudden arterial occlusion contraindi-

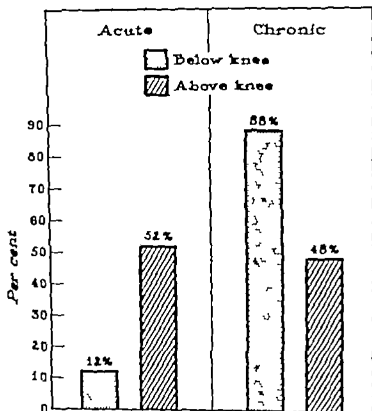


Fig. 131—Incidence of acute occlusion as compared with chronic onset. (Courtesy of Kelly P J., and James, J M. J Bone & Joint Surg. 39-A:883-891 July 1957)

cates amputation below the knee and may indicate some difficulty with amputation above the knee (3) A function ing knee joint is a prerequisite (4) The skin to at least the middle of the leg should be unaffected by ischemic lesions (5) There should be good bleeding at the site of the amputation (6) There should be some hope of rehabilitating the patient. (7) Thromboangiitis obliterans may be an indication for amputation below the knee if conservative measures and toe amputation have failed

Indications for amputation above the knee are (1) sud

den arterial occlusion with weak or absent femoral pulse (2) sudden arterial occlusion with other signs such as coolness of skin above middle part of the leg high venous filling time evidence of severe ischemia by elevation-dependency tests or evidence of only fair bleeding at time of amputation and (3) embolic occlusion and gangrene of the leg due to peripheral aneurysm usually of atherosclerotic origin

Indications for toe amputation are lesions limited to 1 or possibly 2 toes in (1) patients with clinical diagnosis of thromboangiitis obliterans in whom conservative measures have been exhausted and (2) patients with purely infectious diabetic lesions that have not responded to conservative measures or with diabetic lesions with minimal occlusive vascular findings

► [Most experienced surgeons have been consulted by patients who have had several amputations, starting with removal of a toe, then transmetatarsal amputation, amputation in the region of the ankle, then a below knee amputation and finally termination of the operative spree with an above-knee amputation which should have been done in the first place If the first operating surgeon had been well informed about the criteria for determining the proper level of amputation in occlusive vascular disease, the patient would have been spared much suffering and expense. The article by Kelly and Janes is timely It should be read by every surgeon who may at some time do an amputation because of occlusive vascular disease.—Ed.]

Prosthetic Team and Child Amputee Robert Mazet Jr and Milo B Brooks[7] call attention to the value of a team approach in solving the problems of the amputee The patient surgeon limb fitter and amputee trainer comprise the basic prosthetic team Augmentation by an engineer psychiatrist social service worker and the employment counselor frequently increases its effectiveness If the amputee is a child the prosthetic team is even more important It must include one or both parents or other relatives, the pediatrician and ideally the child s teacher

In the Child Amputee Prosthetic Program at the University California Los Angeles a group decision as to the best course of therapy is reached This may be preprosthetic physical therapy or other treatment If the patient is judged ready for a prosthesis it is prescribed After its fabrication the device is checked for fit and function and training in its use is provided The child returns to the am-

(7) J Internat Coll. Surgeons 27.70-82, January 1957

putation conference at intervals of 3-6 months for review of his progress If repair or replacement of the prosthesis is necessary it is ordered If further training psychologic help or other therapy is indicated this is prescribed

The children examined by the UCLA group presented all manner of deformities If the anatomic and functional status of the extremity proximal to the level of amputation or deformity is normal or nearly so the deformity is classified as uncomplicated Surgical intervention here is rarely indicated except to ablate functionless vestigial digits which may be cosmetically offensive or may interfere with the function of the prosthesis Traumatic amputations are included in this group since the fitting problems are similar Present prosthesis knowledge permits fitting of functional artificial limbs at any level above the carpal and tarsal areas There are no sites of election in the upper extremity All possible length should be preserved Fitting and fabrication in these instances is usually not difficult. Acceptance of the device and training in its use may offer more serious problems

Phocomelia and some other deformities are grotesque with ill formed and distorted terminal segments These are frequently accompanied by dysplasia of the hip or shoulder joints short femora or humeri limited function of the knee or elbow and divers muscular anomalies Fitting is more difficult Impaired function of the extremity invariably makes control and use of the artificial limb a greater challenge to the prosthetic team than the uncomplicated deformity Help for these persons is limited

Surgical intervention for complicated deformities is most frequently indicated to rid the patient of a useless part that perhaps requires an unsightly misshapen socket may be irritated by the wearing of a prosthesis or may interfere with function As a rule it is better not to remove the anomalous part until the patient requests the operation Epiphyses and joint function should be preserved at operation whenever possible

Amputations and Amputees—Adult and Juvenile are discussed by Claude N Lambert and Albert J Novotny[8] (Univ of Illinois) Amputations of the small toes and trans

(8) S. Clin. North America 37 119 134 February 1957

metatarsal amputation (Fig 152) result in little disability the remaining foot being capable of full weight bearing with reasonable comfort No prosthesis is required regular shoes can be worn and often gait abnormalities appear only during rapid walking Amputations in the foot posterior to the level of the transmetatarsal amputation are not satisfactory Usually the remaining foot is pulled down into severe equinus by the unopposed gastrocnemius and the patient walks on the scar, which breaks down or becomes painful

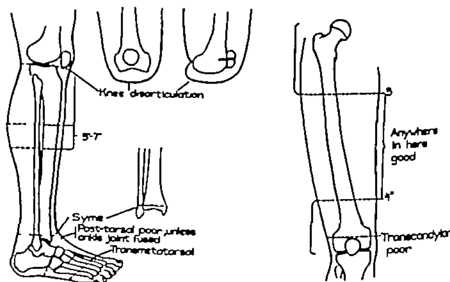


Fig 152 (left) —Lower leg amputations.
Fig 153 (right) —Above knee amputations.
(Courtesy of Lambert, C. N., and Novotny A. J: S. Clin. North America 37:113-134 February 1957)

The fitting of a prosthesis is difficult and from the patient's standpoint unsatisfactory The Syme amputation is an excellent procedure that provides an end weight bearing stump which can be used satisfactorily without a prosthesis when necessary and can be fitted with a sturdy prosthesis resulting in a stable gait

Below knee amputation presents no great difficulty but certain principles must be observed Skin flaps should not be excessively long should not be extensively undermined and should include the deep fascia In the prosthesis weight bearing is provided for by the socket and since the end of a below knee stump is an unsatisfactory weight bearing part weight bearing is shifted almost entirely to the con-

dylar flare of the tibia. In this area the socket is molded carefully to the bony contour of the stump with relief for the hamstring tendons the head of the fibula and the peroneal nerve.

The most preferred prosthetic ankle joint consists of a rubber block between the shin piece and the foot, these two pieces being joined by a steel cable through the center of the block. It provides motion in all directions and thus absorbs much of the torque developed in walking The most desirable prosthetic foot is made of wood with a rubber heel sole and toe. It absorbs much of the shock of heel strike and weight bearing which would otherwise be transmitted to the ankle joint and to the stump and provides a toe break flexible in all planes allowing considerable variation in gait pattern

Amputation through the knee joint gives a good end weight bearing stump and is almost always painless If necessary the patient can put direct end weight bearing on the stump even without a prosthesis Amputation through the thigh above the knee (Fig 153) because it removes the knee and disturbs the function of certain of the hip musculature presents a much more complex problem of restoration than does below knee amputation Because of muscular imbalance abduction and flexion contracture of the stump are likely to develop Stump exercises should be started as soon as possible after amputation and the stump should be held in a position of abduction and extension

Among the many advanced artificial limbs the suction suspension and the quadrilateral socket should be mentioned In the former the socket is fitted snugly to the stump and when the stump is placed into the socket an air seal is formed between the bare stump and the smooth inner surface of the socket. Any tendency for the socket to displace from the stump is countered by negative pressure in the air space between the end of the stump and the end of the socket. A valve placed in the socket near its distal end permits air to escape from the air space in the socket thus controlling the degree of negative pressure. When suction alone because of shortness or scarring of the stump is inadequate to support the limb addition of a simple suspension aid is often adequate.

The quadrilateral socket fits the deep muscular contour of the stump rather than the external contour The inlet of the socket has four distinct sides and four angles The socket is designed to give the amputee maximal comfort support and function The medial wall is fitted to the area between the adductor tendon anteriorly and the ischial tuberosity posteriorly and is usually ½ in shorter than the dimension so that a snug fit is obtained The anteromedial angle is relieved for the abductor tendon and the posteromedial angle for the hamstring origin The posterior wall is at the same height as the medial wall and is parallel to the floor In its medial half is a thickened area on which the ischium rests and in its lateral half is hollowed-out or relieved area to accommodate the inferolateral portion of the gluteus maximus

The ischium bears 60% of the body weight and the gluteus maximus the rest As the ischial tuberosity bears down on the ischial seat it tends to slide forward into the socket. This displacement is prevented by the anterior wall which is 2 in higher than the posterior or medial wall In the medial half of the anterior wall is a bulge inward which fits into the femoral triangle and in the lateral half is a hollowed-out area which is fitted to the quadriceps muscle. The lateral wall is fitted up to the greater trochanter Distally the socket assumes a conical shape to conform to the stump.

The knee of an above knee prosthesis is a passive mechanism and its control depends entirely on the muscles of the hip The type of knee joint most often used is the single axis joint with constant friction so that the ease with which the leg swings can be controlled

As a prosthetic hand the combination of an Army Prosthetics Research Laboratory hand with the new type of California upper extremity gives the best function An amputation through the metacarpals is a poor amputation from the standpoints of function and fitting of a prosthesis. Amputations through the wrist joint can be fitted with a new type prosthesis but only with difficulty As an elective amputation the forearm should be amputated about 2 in. above the wrist joint thus saving sufficient power of pronation and supination and making the fitting of a prosthesis easier particularly as to length

In above-elbow amputations, the longer the above elbow stump the better the function The problem of relative length of the upper arm is minor If the whole upper arm is preserved a prosthesis must be longer to accommodate the elbow locking mechanism but to compensate for this the forearm portion can be shortened by an equal amount, so that the over all length is the same as that of its opposite mate After shoulder disarticulation a prosthesis can be successfully fitted but obtaining good function is difficult. The true shoulder disarticulation and even the forequarter amputation can also be successfully fitted with a modern prosthesis

Child amputees differ from the adult amputees in many respects They have not had as many years to become accus tomed to normal limbs nor do they have as many detailed technical skills Their mental shock from the loss of an arm and/or leg is usually greater They are often the center of attention at school mostly to their detriment. The pros theses follow the general outline of those for adults except relative size In the juvenile amputee with an acquired loss it is more important than ever to save all possible length of the involved bone. One other factor in the child amputee is the growing out of the bone from the skin at the end of the stump This occurs because the bone grows faster than the surrounding skin and muscle, the latter usually be ing more atrophic. It may be necessary to reamputate the projecting bone end but relatively few acquired amputa tion stumps need such revision

A lower extremity prosthesis should be fitted as soon as the child shows a tendency to stand to help learn balance. The rhythm of stepping motion will come later, but balance can be learned at an early age In the upper extremity a nonfunctioning plastic mitten can be fitted at an early age, with the child using it to aid in crawling The youngest child that the authors have fitted with a functioning upper extremity prosthesis was aged 18 months

Amputations and Modern Prosthetics According to Clin ton L. Compere and Robert G Thompson[9] (Northwestern Univ) a total rehabilitation plan should be formulated and explained to the amputee preoperatively The ---

(9) S. Clin. North America 37 103-118 February 1957

should be carried through to complete vocational and sociologic return to a position in society

Unless definitely contraindicated all definitive amputations should be performed with tourniquet hemostasis All major nerves and blood vessels should be isolated and identified The site of bone section should be marked with a sharp incision of the periosteum with a scalpel Before

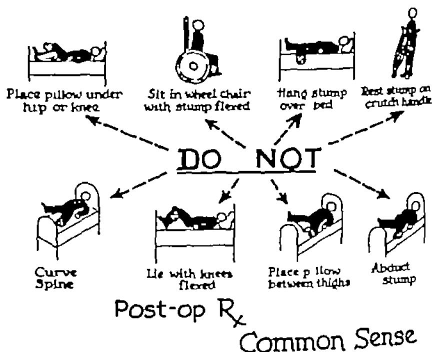


Fig 154—Positions illustrated are comfortable and are assumed naturally by amputee. They must be reduced to minimum by instruction and explanation as to danger (Courtesy of Compere, C. L. and Thompson, R. G: S. Clin. North America 37 103-118, February, 1957; from *Syllabus* [Los Angeles: Prosthetics Education Program University of California])

closure the tourniquet must be removed and complete hemostasis obtained by ligation of bleeding points If the amputation is th[illegible]gh a region of osteomyelitis or other infection an o[illegible] ircular type is the method of choice. Skin traction i[illegible] andatory for this procedure to maintain adequate skin [illegible] r later secondary closure.

As soon as stump pain permits the patient should be instructed about exercises for the affected extremity starting on a rehabilitation program that will best prepare him for successful use of a prosthesis When wound healing has occurred and the sutures are removed the patient is in-

structed in bandaging the stump for shrinkage toward final definitive size Routine elastic bandages of adequate length and width may be used The elastic bandage should be wrapped about the stump in such direction that no circulatory choking of the proximal stump occurs The pressure is applied obliquely the effect being to gradually milk or massage out the surgical edema and induration If this is continued with daily replacement of the bandages the stump usually shrinks to definitive size in 4-6 weeks The time of fitting of a prosthesis can thus be hastened

While still in the hospital the patient should be warned against positions that encourage contractures (Fig 154) An amputation of any length in the upper or lower extremity with the exception of the distal two thirds of the lower extremity deserves a fair evaluation and prescription of a prosthesis by a competent surgeon prosthetist and therapist. The prescription is simplified by primary determination of stump category Sites of election for lower extremity amputations should be considered when possible.

After fitting all amputees should be evaluated as to proper fabrication and alinement of the fitted prosthesis with specific recommendations on modification, replacement and training

Upper Extremity Amputation Surgery and Prosthetic Prescription Since many persons with amputations in the so-called undesirable areas have been successfully fitted with appliances developed in recent years Robert Mazet Jr Craig L. Taylor and Charles O Bechtol(1) (Univ of California Los Angeles) contend that the concept of sites of election in upper extremity amputations is obsolete. Amputation surgery of the upper extremity should save all possible length in all areas Prosthetic considerations need not dictate the amputation site. Physical aspects such as skin coverage, adequacy of circulation good innervation and function of the part to be saved should be the determining factors in the decision as to the level of amputation

Familiarity with the latest technics of prosthetic manufacture and fitting are as essential for the surgeon as a knowledge of surgical technics Realization of the potentialities and limitations of recently developed prosthetic

(1) J Bone & Joint Surg. 38-A:1185-1198 December 1956

should be carried through to complete vocational and sociologic return to a position in society

Unless definitely contraindicated all definitive amputations should be performed with tourniquet hemostasis. All major nerves and blood vessels should be isolated and identified The site of bone section should be marked with a sharp incision of the periosteum with a scalpel Before

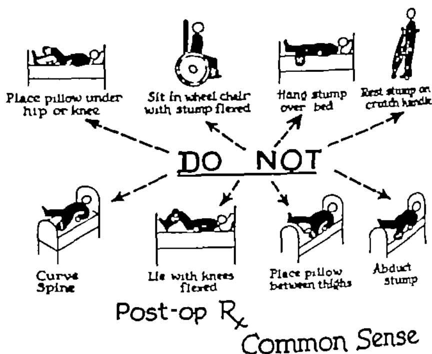


Fig 154 —Positions illustrated are comfortable and are assumed naturally by amputee. They must be reduced to minimum by instruction and explanation as to danger (Courtesy of Compere, C. L., and Thompson R. G.: S Clin. North America 37 103-118 February, 1957; from *Syllabus* [Los Angeles: Prosthetics Education Program, University of California])

closure the tourniquet must be removed and complete hemostasis obtained by ligation of bleeding points If the amputation is through a region of osteomyelitis or other infection an open circular type is the method of choice Skin traction is mandatory for this procedure to maintain adequate skin for later secondary closure.

As soon as stump pain permits the patient should be instructed about exercises for the affected extremity starting on a rehabilitation program that will best prepare him for successful use of a prosthesis When wound healing has occurred and the sutures are removed the patient is in-

At present pectoral cineplasty has limited usefulness It should be used *only in patients with such exceptional* conditions as bilateral shoulder disarticulation In such a patient another source of prosthetic control is urgently required Cineplasty is not advisable in amputees before adolescence and is not usually cosmetically acceptable to women

Experimental Attempt to Replace Muscle Function by Elastic Endoprostheses was made by John Sevastikoglou[3]



Fig 155 —Dorsolumbar spine 22 days after insertion of rubber band. Severe scoliosis has been effected. (Courtesy of Sevastikoglou, J Acta orthop scandinav 26 161 183 1957)

(Karolinska Inst. Stockholm) in 13 rabbits The animals were operated on and a stretched rubber band was mounted in the vertebral skeleton between the crista ilica and one of the lower thoracic vertebrae Severe to moderate scoliosis

(3) Acta orthop. scandinav 26 161 183 1957

appurtenances is necessary for prescription of the appliance best suited to the needs of the given patient Such prescription is the privilege of the surgeon and cannot be delegated. Functional prosthetic replacements are available for almost all types of upper extremity amputations

The surgeon should share the responsibility for amputee rehabilitation with the other members of the prosthetic team (patient therapist trainer prosthetist job counselor and psychologist) but he must remain captain His responsibility to the patient does not terminate with wound healing It continues through the period of rehabilitation With co-operation from other team members the surgeon must supervise the readjustment of the patient to the handicap and direct the restoration to social and economic independence.

Cineplasty End Result Study of 78 biceps and 29 pectoral cineplasties revealed that 61.7% of the patients were wearing their prostheses at the end of a year or more 73 1% in the former group and 31% in the latter Ernest A Brav August W Spittler Harold B Luscombe John H Kuitert, William F Macdonald Frederick E Vultee Jr George H Woodard Maurice J Fletcher and Fred Leonard[2] (Walter Reed Army Med Center) believe that cineplasty should be performed only at established amputation centers where all members of the clinic team can participate in the proper selection of patients where there are surgeons familiar with the operative procedure where training supervision by experienced psychiatrists is available and where fitting can be done by prosthetists who understand the peculiar problems of the cineplasty amputee There must also be provision for subsequent specialized prosthetic maintenance.

Cineplasty operations should be limited to carefully selected patient The local condition of the stump the desire and motivation of the patient for the procedure and the functional requirements should be considered When these requirements are met the advantages of biceps cineplasty to the below the elbow amputee are sufficiently great that the operation should be offered The advantages of biceps cineplasty to the long above-the-elbow amputee are not so apparent and the usefulness of this procedure is controversial

(2) J Bone & Joint Surg 39-A 59-76 January 1957

At present pectoral cineplasty has limited usefulness It should be used only in patients with such exceptional conditions as bilateral shoulder disarticulation In such a patient another source of prosthetic control is urgently required Cineplasty is not advisable in amputees before adolescence and is not usually cosmetically acceptable to women

Experimental Attempt to Replace Muscle Function by Elastic Endoprostheses was made by John Sevastikoglous



Fig 135 —Dorsolumbar spine 2 days after insertion of rubber band. Severe scoliosis has been effected. (Courtesy J Sevastikoglou, J Acta orthop. scandinav 26 161 183 195)

(Karolinska Inst Stockholm) in 13 rabbits The animals were operated on and a stretched rubber band was mounted in the vertebral skeleton between the crista ilica and one of the lower thoracic vertebrae Severe to moderate scoliosis

Acta orthop scandinav 26 161 183 195

resulted (Fig 155) which in 3 was followed up to 608 days. The scoliosis was of a permanent character, i.e., it remained more or less unchanged 116 or more days after the rubber was removed

No pathologic reactions of the tissues were observed after 1-1½ years In all animals the rubber was isolated in a very thin capsule of connective tissue lubricated by a small quantity of a highly viscous fluid The elasticity of rubber samples remaining in the body up to 1½ years or stored outside it at room temperature deteriorated about 50% Study of their mechanics showed that stainless steel springs of a high quality, under optimal conditions retain elasticity practically without limitation of time and action

The author believes that elastic internal devices constructed from steel springs encased in rubber can be successfully used as substitutes for paralyzed muscles With rubber and metal springs tissue reactions are limited to a minimum Such prostheses are more supple and enclosing the springs in rubber avoids the filling of the central cavity of the spring by hard connective tissue which probably would affect the functioning of the spring The field of indications for such operations is large Besides the many varieties of paralysis arising from poliomyelitis traumatic nerve injuries scoliosis spastic paralysis and other deformities can be alleviated

► [This is an interesting study of the effect of dynamic force applied unilaterally to the spinal column. The author was successful in producing scoliosis when the force used was a rubber band and when a steel spring was used. Professor Gruca of Warsaw has used steel springs to correct curvatures of the spine in children.—Ed.]

Postoperative 'Restoration" of Hemipelvectomized Patient is discussed by Charles J Churchill R J Simonetta, John Lyford III and I Muss[4] (Louisville) Although more tissue is removed from patients undergoing hemipelvectomy than by any other operation on the human body such persons need not be totally disabled The authors performed the operation on 4 patients using the technic of Gordon Taylor No deaths resulted nor were there any immediate serious postoperative complications

Prostheses for hemipelvectomy amputees have been de-

(4) J Kentucky M. A. 55:904-906, October 1957

signed (Figs 156-158) which permit adequate and comfortable fitting of the patient with a functional prosthesis

Such a radical loss of tissue as accompanies this operation need not cripple a patient since prostheses plus training by the psychiatrist can enable him to walk comfortably Some patients have survived for an appreciable length of time and



Fig. 156 (left) —Patient with large chondrosarcoma of right femur 3 weeks after hemipelvectomy

Fig. 157 (center) —Same patient wearing specially constructed prosthesis.

Fig. 158 (right) —Same patient showing appearance while wearing prosthesis, dressed and working as salesman.

(Courtesy of Churchill, C. J., *et al.*: J Kentucky M. A. 55:904-906, October 1957)

have been "restored" so as to return to their former occupations and continue as self supporting members of society (farmer salesman carpenter) In the postoperative training balance is an important factor because of the alteration in the center of gravity It is equally important that the stump which actually represents a covering of the pelvic viscera by the gluteus muscle, be prepared for partial weight bearing To this end exercises are provided with the stump wrapped in soft material to give the patient the feel of an artificial weight bearing stump

Hemipelvectomy Experience in Series of 39 Cases is reported by Norman L. Higinbotham and Bradley L. Coley[5] (Mem'l Center for Cancer New York) The commonest indication was chondrosarcoma (27 cases) followed by osteogenic sarcoma (6) It is felt that hemipelvectomy is not generally indicated in osteogenic sarcoma This series included 28 males and 11 females aged 17-65 The primary tumor was in the innominate bone in 31 patients The postoperative death rate was 7.7% Two maneuvers were found helpful during surgery

METHODS —When the common iliac artery has been isolated and the bifurcation exposed in the early stages of the operation before the symphysis pubis is divided the external iliac artery is doubly ligated and divided between ligatures. Then a seraphin (rubber covered bulldog clamp) is placed on the hypogastric artery to occlude it and all its branches temporarily until the extremity has been removed When the seraphin is removed any bleeders are easily caught and ligated This expedient enhances the viability of the posterior flap and makes for better wound healing

A scalpel is helpful for dividing the symphysis pubis. Because it will cut cartilage readily it is easy to follow the joint line whereas with a chisel or osteotome it is a common error to deviate to either side of the joint leaving a roughened bone surface. Similarly the sigmoid curve of the sacroiliac joint can be followed easily with the scalpel Once the plane of cleavage has been established the cutting and prying effect of the chisel completes the separation. A few trimming touches with a rasp insure smooth residual surfaces at the sacroiliac and pubic joints.

Ambulation begins for most patients 2 days postoperatively The first dressing is not done too early The most troublesome complication during convalescence is delayed wound healing Careful follow up frequent at first and bi annually later is essential and the possibility of local recurrence must always be borne in mind Pain is not necessarily a first symptom here and the patient may feel only a little fulness or a small lump or complain that the prosthesis does not fit so well as before The usual complication leading to death of the patient is pulmonary metastasis. The 5 year survival rate in these patients was 40%

(5) Cancer 9 1233-1238 Nov Dec., 1957

Prevention of Infection in Surgical Wounds is discussed by Ralph Adams[6] (Boston Univ) After an abrupt rise in the rate of surgical wound infection in a small hospital the following procedures were instituted Each was proved by bacteriologic studies to be effective in reducing contamination.

Hurried preparation of the patient s skin was replaced by a thorough timed 10-minute scrub with 5% hexachlorophene soap An 8-minute hand scrubbing routine was changed to 1 minute s hot soapsuds wash and rinse, 4 minutes vigorous hexachlorophene soap scrubbing and rinsing with disposal of the brush used another 4 minutes of vigorous scrubbing and rinsing using a second brush and 1 minute of cotton swab washing with fresh Zephiran* solution Everyone in the operating room was required to wear double masks which were changed hourly Ultraviolet radiation was installed in the operating rooms On the ward nurses and doctors were required to wear gloves cap and mask while changing dressings All clean dressings were immediately wrapped in newspaper sealed and cast into waste cans All septic dressings were firmly wrapped in waxed paper bags sealed marked and sent to an incinerator for burning Instruments used in septic cases were similarly sealed and marked for special handling and decontamination Patients with septic wounds were separated from other patients The prophylactic use of antibiotics before surgery was stopped

Institution of these measures reduced surgical wound infections from 8 in 603 operations to 2 in 264 operations

► [The prophylactic use of antibiotics has proved to be an unwise procedure. It lulled the surgical team into a state of false security In some instances this led to carelessness in utilizing strict aseptic technic. Operative wound infections became much more common.—Ed.]

Diagnosis of Bone Lesions by Needle Biopsy This minor procedure has a fairly high degree of accuracy James A. Dolphin and George Hammond[7] encourage its use in all

(6) New England J Med. 256:623-628, Apr 4, 1957
(7) S Clin. North America 37:891-898 June 1957

patients who require histologic or bacteriologic examination for diagnosis It is particularly valuable in bones relatively inaccessible to surgical exposure More frequent use is urged for definite diagnosis of inflammatory and neoplastic lesions that heretofore have had presumptive diagnosis only

From 1951 through 1956 60 needle biopsies of various bones were performed in 54 patients at the Lahey Clinic

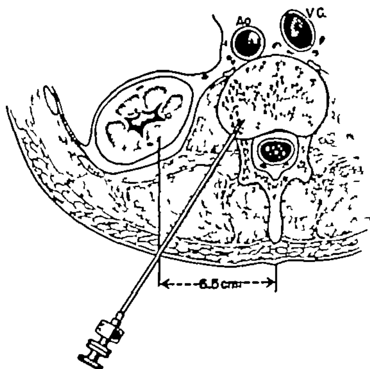


Fig 159 —Anatomic relations of needle in position for biopsy of lumbar vertebral body (Courtesy of Dolphin, J A, and Hammond, G S Clin North America 37:891-898, June, 1957)

The following technic is used to obtain biopsy for a lumbar vertebral body

TECHNIC —With the patient prone, a pillow is placed beneath the abdomen to elevate the spine and separate the transverse processes. Preoperative posteroanterior x rays of the lumbar spine are studied to note the relation of the transverse processes to the spinous process of the diseased vertebra. The spinous process of the vertebra to be biopsied is usually located at the level of the transverse process of the next lower vertebra. A skin incision only large enough to admit the needle is made 6-7 cm. (about 4 fingerbreadths) to the right or left of the spinous process depending on the site of the major pathology The outer needle and stilet (Turkey needle with a trephine tip) are inserted at an angle of 45 degrees and directed inward and medial-

ward until the transverse process of the vertebra below the "target" vertebra is struck, and the needle is then angled cephalad so that the tip glances off the superior surface of this transverse process. Further advancement in this direction brings the tip of the needle in contact with the desired vertebral body (Fig 159). Fluoroscopic examination confirms the position of the needle, but x rays in two planes are made for verification.

The outer needle and stilet are then firmly imbedded in the bone, the stilet is removed and the trephine needle is inserted into the outer needle. When bone is encountered, the knurled extension handle is placed over the hub of the trephine needle and successive turns of this needle are made in one direction with sufficient downward pressure to advance it into the bony lesion. When the needle

LOCATION AND RESULTS OF NEEDLE BIOPSY IN BONE LESIONS

SITE	NO. OF BIOPSIES	SPECIMEN ADEQUATE FOR DEFINITE DIAGNOSIS	SPECIMEN ADEQUATE FOR SUGGESTIVE DIAGNOSIS	SPECIMEN INADEQUATE FOR DIAGNOSIS
Pelvis	24	22	1	
Vertebra	16	11	2	3
Humerus	5	4		1
Tibia	5	5		
Femur	4	4		
Sacrum	2	1	1	
Scapula	2	2		
Rib	1	1		
Metacarpal	1	1		
TOTAL	60	52 (86.6%)	4 (6.7%)	4 (6.7%)

has reached sufficient depth, it is rotated several turns, without inward pressure, to cut off the core from its base. The trephine needle is withdrawn with the specimen, which is expressed by means of the stilet. By slight change of the angle of the outer needle additional cores of tissue are removed.

Of 60 specimens 52 (86.6%) were adequate for pathologic diagnosis 4 were designated as "suggestive" or consistent with the subsequent clinical course and 4 were inadequate for diagnosis (table). Among the 47 patients with adequate biopsy specimens a positive diagnosis was established in 31 (66%) and a negative biopsy in 16 (34%). Among these 16 there was a possible error of the method in 6 which constitutes a presumptive error of 13% among the 47 patients

Primary Versus Secondary Tendon Repair Michael L. Mason[4] states it is not a matter of whether tendons should

(4) Quart. Bull. Northwestern Univ. M. School 31:120-1,3 Summer

be repaired primarily or secondarily but in which instances primary repair is indicated and in which it should be omitted the wound simply closed and secondary repair done later Time since injury is a yardstick which at once puts the case in one category or the other The longer bacterial contaminants remain in a wound the greater the likelihood that they have become invasive and an infection has arisen. Most surgeons feel it is unwise to overstep a limit of 46 hours after injury

The degree and nature of contamination of the wound are important The nature of the first aid which a wound has received and any attempt at surgery should be known to the surgeon Tendon repair should be postponed if serious contamination occurs from certain injuring agents under certain circumstances and on certain types of jobs, e.g wounds pathologists sustain while doing an autopsy wounds from human teeth and wounds of meat handlers.

The type of wound must also be considered In lacerating and incised wounds where the damage is confined to the actual line of the laceration tendon repair may be done all other conditions being favorable Crushing abrading and explosive types of wounds are unsuitable for tendon repair

The skin and subcutaneous tissue over the site of tendon repair must be covered adequately The tendons involved and site of involvement must be considered The outlook for extensor tendon repair is better than for flexor The exact site of the injury especially in flexor tendons has caused a veritable tempest among surgeons interested in hand surgery

If the tendons have been divided in the lower forearm or wrist every effort should be made to repair at once provided other conditions are satisfactory Everyone agrees that the r [illegible] lus tendons and the flexor pollicis longus and car [illegible] rs should be repaired but some advise against r [illegible] r the sublimis tendons The nerves should always be [illegible]utured at this time The author believes that if conditions are favorable and the suture lines do not lie within the carpal tunnel the sublimis tendons could be sutured at the first instance If the division lies in the carpal tunnel, primary repair is entirely feasible since the transverse carpal ligament must be divided to repair the median nerve.

The situation in the palm is somewhat analogous to the lower forearm and primary repair is feasible if other conditions are right

There is real disagreement as to tendon damage in the critical finger area which extends from the proximal end of the fibrous sheath in the palm to the middle of the middle phalanx. If the profundus only is involved primary repair is out of the question If both profundus and sublimis are divided there is a growing conviction that primary repair should never be attempted but that the wound should be closed and a graft done later The author believes that in very young patients seen within 2 hours after injury under the most propitious conditions and with careful technic primary suture can be successfully done If the profundus has been divided over the distal half of the middle phalanx other conditions being satisfactory a primary repair is feasible In the thumb primary suture anywhere along the course of the tendon is indicated

Other considerations for tendon repair in acute injury include the patient s general condition presence of other injuries facilities for proper repair amount of time available and training and experience of the surgeon

Surgical Uses of Saran (Vinylidene Chloride Vinyl Chloride) Co-polymer Staple Fiber Preliminary Report is given by Irving Mauer[9] (USPHS Hosp., Staten Island N Y) There has been need for a nonwettable resilient packing and pressure material The author found a special Saran staple fiber to fill this need The staple fiber is similar to the material used commercially in the manufacture of dolls hair except that the color has been omitted It is a bulky kinky collection of fibers of the same length It may be sterilized by autoclaving or soaking It absorbs less than 0 1% moisture (Fig 160)

If Saran is used as a pressure packing against skin grafts or after excision of Dupuytren s contracture it maintains its pressure against the graft Bleeding if any seems to be drawn up by the fibers by capillary action to be absorbed on the outer dressing Thus the pressure which was initially applied is maintained When Saran is used instead of mechanics waste there is no matting and the blood or serum

(9) Mil. Med 1?0 354-355 May 195

soaked outer dressings may be changed without disturbing the wound

In contaminated wounds, sterile Saran was tried as initial packing It was felt that wounds healed faster with satisfactory granulations since the depths of the wound could be irrigated satisfactorily with saline or antibiotic solution passing easily through the interstices of the Saran packing The granulations were not disturbed by daily removal or



Fig. 160.—Saran. (Courtesy of Mauer I : Mil. Med. 120 354-355 May 1957.)

repacking As healthy granulations piled up the Saran packing was gradually extruded from the wound

It may also be used as a dressing over wounds leaking urine A Saran dressing allows the urine to leak through to be absorbed on the outer dressings with minimal wetting or maceration of skin No skin irritation was noted nor was there any difficulty with removal of the material buried in a wound

Joint Paracentesis from Anatomic Point of View I. Shoulder Elbow Wrist and Hand. In earlier years joint paracentesis was performed largely to aspirate serous or suppurative fluids Since the discovery that locally injected hydrocortisone has beneficial effects on arthritic joints,

more and more physicians are utilizing this method for treating joint conditions

Six principles for selecting sites for paracentesis are enumerated by James A. Miller Jr[1] (Emory Univ) as a result of a study of the anatomy of joints These include (1) selection of sites as far removed as possible from large vessels nerves or tendons (2) use of bony landmarks, (3) use of positioning to aid in palpation (4) use of distraction and positioning to enlarge the target area (5) use of positioning



Fig. 161—Site for paracentesis of 1st carpometacarpal articulation. With thumb adducted, base of 1st metacarpal, m is accentuated. Needle enters joint cavity immediately volar to tendon of insertion of abductor pollicis longus, apl, fold produced by abductor pollicis longus. bv=basilic vein. (Courtesy of Miller J A., Jr Surgery 40:993-1006, December 1956.)

to stretch the capsule and (6) avoidance of scoring articular cartilages On the basis of these principles the following sites were selected for joint paracentesis (1) for the sub-*acromial bursa, a lateral approach inferior to the* anterior tip of the acromion with the arm distracted (2) for the shoulder joint a posterior approach a fingerbreadth below the angle of the acromion with the arm medially rotated (3) for the elbow a posterolateral approach proximal to the head of the radius with the elbow flexed (4) for the region of the lateral epicondyle a lateral approach with the elbow flexed (5) for the radiocarpal joint a dorsal approach in the space just distal to Lister's tubercle between the extensor digitorum communis and extensor carpi radialis brevis te

(1) Surgery 40:993-1006, December 1956.

dons with the wrist flexed and the ulnar deviated (6) for the intercarpal joints a dorsal approach radial to the common extensor tendons and distal to the lunate with the wrist flexed and the ulnar deviated (7) for the 1st carpometacarpal joint an anterolateral approach with the thumb strongly adducted (Fig 161) (8) for the 5th carpometacarpal joint a medial approach between the extensor carpi ulnaris and the abductor digiti quinti (9) for the metacarpophalangeal joints a dorsal approach on the radial or the ulnar side of the extensor tendon aided by flexion and distraction and (10) for the interphalangeal joints the same approach as for the metacarpophalangeal joints

Impaling (Telescoping) Operation for Pseudarthrosis of Long Bones in Childhood is described by Joseph E. Milgram[2] In this condition union may be facilitated in certain cases by impaling the avascular proximal end in the vascular distal medulla This entails further shortening Early acceptance of such shortening is urged to encourage early union and resumption of function

TECHNIC—No tourniquet is used initially Longitudinal incision is dictated by scars of previous procedures The incision in the leg avoids division of motor vascular and neural structures particularly close to the ankle joint. The pronged segment is first developed and freed. The fibula if also the site of a pseudarthrosis can be exposed through the same incision and stripped distally particularly if it is deformed and may be brought into contact with the proximal tibia and proximal fibula.

The broader vascular segment of the tibia, usually the distal fragment is exposed freely anteriorly but cautiously posteriorly conserving soft tissue attachments if obviously vascular The distal medulla is uncapped. The proximal prong is fish scaled to roughen it, and its medulla should be opened distally or along one side as judgment dictates watching bleeding areas develop under freshening

The mobility of the distal segment of the limb is tested. Fibular osteotomy is required if it is intact. The next step is to judge the amount of telescoping possible. The prong proximally is marked with a chisel lightly to insure that when impaled into the medulla it will stop at the predetermined depth measured from the end of the distal tibial segment when uncapped It is best to err on the conservative side to avoid possibility of damage to the epiphysial plate Penetration is checked by anteroposterior and lateral x rays, and if there is satisfactory fixation by wire loops or screws the choice depending on the friability of the cortices the area is packed with bony fragments or autogenous grafts. In each case distal pin trans

(2) Bull. Hosp Joint Dis. 17 152 172 October 1956

fixions through the upper fragment and through the os calcis are used as an adjunct to prevent rotation of the proximal prong on its distal host within the padded plaster-of paris splint and to preclude deeper impaling with possible epiphysial damage.

If the fibula can be made to contact the proximal tibial fragment laterally it is impaled through a window in the lateral tibial surface



Fig. 162.—Age 1 year. Closed osteoclasis had been done in early months of life. (Courtesy of Milgram, J. E.: Bull. Hosp. Joint Dis. 17 152-172, October 1956.)

and fastened both to tibia and proximal fibula at freshened sites with wire loops passed through holes made with a jeweler's drill

After closure the pins are incorporated in a well padded plaster support. At 3 weeks the sutures are removed and a molded snug plaster support incorporates the pins which may be left undisturbed for 10-12 weeks or longer if desired. No weight bearing is permitted until union is confirmed by x ray

The problem of limb inequality is a separate one and the answers are different in different patients In general epiphysial closure and well limb shortening are fraught with less complications than well limb lengthening

In 4 children so operated on union occurred (Fig 162) The fourth, who had been subjected to step shortening with failure, was reoperated on by the impaling method and union occurred 3 months after operation Four unsuccessful bone grafts had preceded the unsuccessful step shortening

Swivel for Proximal Radioulnar Synostosis was used in 4 patients by H Kelikian and Ara Doumanian[3] (Chicago) The stainless steel swivel, consisting of a cylinder-shaped body and a central rod (Fig 163) is inserted into a gap created by resecting a portion of the radius Either the flexor carpi radialis or flexor carpi ulnaris is used as a supinator

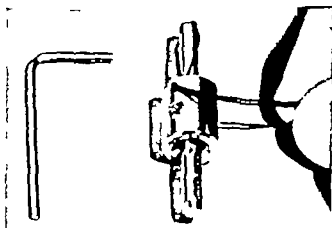


Fig 163.—Prosthesis with central rod pulled down into appropriate position. (Courtesy of Kelikian, H., and Doumanian, A.: J Bone & Joint Surg 39-A:945-952, July 1957)

the insertion of one of these muscles being shifted to the distal fragment of the radius The flexor carpi ulnaris is more effective (Fig 164) but some women object to the bulky prominence produced over the dorsum of the distal end of the forearm

The functional result in the authors patients was good. The method was not used in congenital cases but there seems to be n reason why it should not succeed equally well in these ca s Bones in young persons sometimes produce exces ive llus which may grow over and bridge the gap occupied by the metal prosthesis but minimization of the surgical trauma and use of a comparatively longer metal

(3) J Bone & Joint Surg 39-A:945-952, July 1957

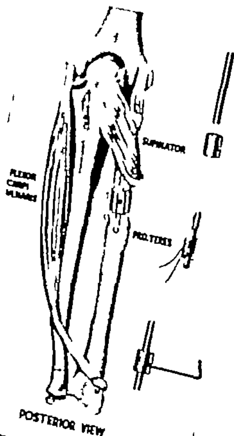


Fig. 164.—Forearm with flexor carpi ulnaris transplanted to serve as supinator. Dotted line indicates level at which resection will be done. (Courtesy of Kelikian, H., and Doumanian, A.: J. Bone & Joint Surg. 39-A:945-952, July, 1957.)

cylinder to span the gap in the radius may eliminate this hazard.

Dowel Intervertebral Body Fusion as Used in Lumbar Disk Surgery. B. R. Wiltberger[4] (Ohio State Univ.) attempted to perfect a simplified method of vertebral body-to-body fusion which would make arthrodesis more practicable and less hazardous. The operation is a dowel intervertebral body fusion in which standard-sized drill holes are prepared between the vertebral bodies across the intervertebral disk space. Slightly oversize, standard precut dowels of autogenous or homogenous bone are inserted in the holes.

Technic.—The disk is resected as indicated. A unilateral partial laminectomy is done, or if the patient has symptoms bilaterally a

(4) J. Bone & Joint Surg. 39-A:284-292, April, 1957.

bilateral procedure is used. The degenerated nucleus pulposus is removed.

The vertebral bodies are distracted by cutting away the interspinous ligament and placing a lamina spreader between the contiguous spinous processes. The dura and nerve root are retracted medially, a broad nerve root retractor being used to protect them. A cottonoid square attached to no. 2 braided silk is packed laterally and slightly cephalad in the vertebral interspace to protect the nerve root exiting one space above. With a ⅝ in. outside diameter Iliff trephine on an oscillating saw, a small semilunar portion of the lamina of the cephalad vertebra is removed, creating a circular

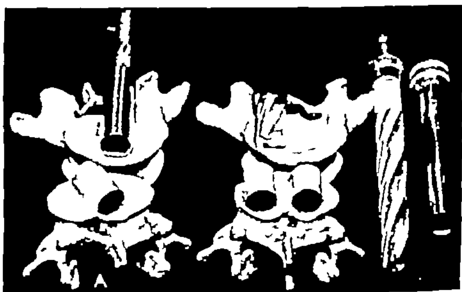


Fig. 165.—Disk resection. *A*, Iliff trephine is used to cut cylindric hole in vertebral bodies. *B*, hole is cut using ⅝ in. drill with protective depth gauge sleeve. (Courtesy of Wiltberger, B. R.: J. Bone & Joint Surg. 39-A:284-292, April, 1957.)

opening ⅝ in. in diameter between the laminae directly over the disk space. The facet is preserved. If the Iliff trephine is marked to indicate depths of 1 in. and 1⅛ in., it can be used to cut the cylindric hole between the vertebral bodies (Fig. 165 *A*); the surgeon can readily observe the penetration of the trephine and stop at the predetermined depth. The cylindric hole can also be cut with a ⅝ in. drill with a protective depth-gauge sleeve (Fig. 165 *B*). If one dowel is used, the cylindric hole should be cut diagonally between the vertebral bodies. If a double dowel is to be used, the openings should be cut directly posteriorly anteriorly from a bilateral partial laminectomy. Both vertebral end plates should be removed during this cutting process to expose the vertebral cancellous bone.

If iliac dowels are used, they can be procured from the posterior superior iliac spine through a small incision (Fig. 166). The 11/16 in. Collet chuck type hole saw is used. From this area it is possible to

obtain several dowels, 3/4 1 in long While the vertebrae are temporarily distracted to a maximum degree the dowels either iliac or cortical, are driven into place and countersunk 1/4 in. with a bone set.

Postoperatively the patient remains in bed for 3 weeks but is allowed to move freely using the "log rolling" technic to change position Thereafter he gradually becomes ambulatory A chair back brace is worn while he is up and about. Most patients wear

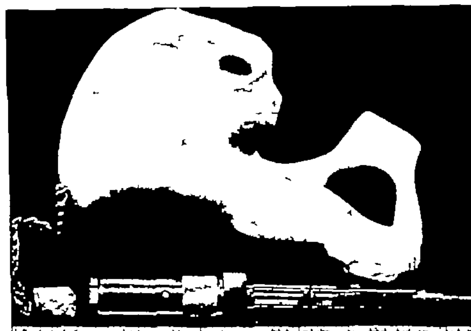


Fig 166.—Iliac dowel removed from posterior-superior iliac spine by Collet chuck type hole saw (Courtesy of Wiltberger B R. J Bone & Joint Surg. 39-A 294 292, April, 1957)

this chair back brace for about 8 months after the operation After convalescence, the patient slowly returns to normal activity

Although the statistics show there are fewer nonunions when iliac bone is used an appraisal of unsatisfactory results indicates that a gradual telescoping of the iliac graft often occurs Thus it seems advisable to insert bilateral dowel grafts if iliac bone is used

Frequent follow up examinations were done on 46 patients on whom this technic was tried There was nonunion in 6 (13%) After more than 2 years 70% had good results These patients were completely asymptomatic or had only occasional slight leg pain or cramps which required no treatment normal activity was not restricted Neurologic complications such as postoperative numbness burning

pain and slight motor weakness occurred often and lasted for about a week

► [The technic described by Wiltberger is ingenious. Most orthopedic surgeons, however will continue to prefer the posterior, interlaminal fusion. For the occasional case in which interbody fusion appears to be definitely indicated, I shall use the technic described by Wiltberger.—Ed.]

Extra-articular Arthrodeses of Hip Advantages of Ischiofemoral Arthrodesis are emphasized by E. Jannelli and G



Fig 167 (left).—Good position of hip which remains outside lines of force in ischiotrochanteric arthrodesis.
Fig 168 (right).—Rapid vitalization of graft with thickening
(Courtesy of Jannelli, L. and Guida, G.: Rev chir orthop. 43:21 242, July-Sept 1937.)

Guida[5] (Naples) This procedure has indications as precise as those for iliofemoral arthrodesis and should be considered in cases other than those in which supra-articular arthrodesis is impossible or has failed. *Ischiofemoral* arthrodesis is a simple technic which causes minimal shock. It is advisable in most cases requiring extra-articular arthrodesis of the hip because it produces definitive and solid ankylosis. With ischiofemoral arthrodesis tendency to adduction, always present in the diseased hip works in favor

(5) Rev chir orth. 43:21 242 July-Sept., 1937

of consolidation of the subarticular bone graft, which is re inforced by pressure (Fig 167) assuring the take and hy pertrophy of the transplant With suitable direction of ischiofemoral arthrodesis parallel to the femoral neck (Fig 168) a local condition is obtained which substitutes for sacrocotylocephalic lines of force by sacroischiofemoral lines across the subarticular bridge

The authors advise rigorous immobilization in thoraco-cruropedal cast for at least 6-8 months to assure good consolidation and growth During the last 2 months this should be stimulated by indirect force provided by a stirrup cast. Numerous pseudarthroses and fractures of subarticular grafts are due to insufficient immobilization The former results from movements of rotation which are not blocked by a cast encasing the foot, and the latter because the graft is subjected too soon to an insupportable weight

Local and general indications and contraindications for iliofemoral arthrodesis are the opposite of those for ischiofemoral arthrodesis The latter type of extra articular arthrodesis is indicated in hips (1) with a tuberculous lesion in the upper part of the joint which prevents a supra articu lar arthrodesis (2) with a lesion in the trochanter or one accompanied by abscess of buttocks or trochanteric region (3) with lesions due to late ossification of the trochanter in children under 16 (4) with contraction in adduction or slight abduction for which an ischiofemoral graft is preferable to an iliofemoral because of smaller distance between femur and ischium (5) with tuberculous osteoarthritis with or without fistula in the buttock or trochanteric region (6) with incomplete fixation for which iliofemoral arthrodesis would be insufficient (7) for coxarthroses in which a joint spontaneously progressing toward ankylosis should not be disturbed In this case the advantage lies in new disposition of lines of force which spares the diseased hip completely Ankylosis in progress relieves the subarticular graft from all flexion pressure thus creating optimal conditions for its vitalization

Contraindications for ischiofemoral arthrodeses are less numerous than those for iliofemoral arthrodesis e.g., (1) extension of a tuberculous osteoarthritis toward the isch... or localization there (2) fistulous abscess in adduct...

gion of thigh (3) excessive abduction which would necessitate a too long subarticular graft (over 10-12 cm) (4) exaggerated flexion of the hip which might expose the sciatic nerve to injury during operation especially with Brittain's classic technic.

When extra articular arthrodesis of the hip is indicated the method should be chosen according to the needs of the individual case The idea should be abandoned that iliofemoral is preferable to ischiofemoral arthrodesis

Partial Intra Plus Juxta articular Arthrodesis with Simultaneous Nailing According to Watson Jones The advantage of arthrodesis is that it gives a painless stable hip,



Fig 169 —Beginning of bridging of bone in fractured femoral head. (Courtesy of Lindstrom N Acta orthop. scandinav 26 255-269 1957)

but it is difficult to secure bone union and earlier methods resulted in up to 50% pseudarthrosis In 1947 Nils Lindström[6] (Harnosand Sweden) introduced partial intra juxta-articular arthrodesis with simultaneous nailing according to Watson Jones After 6 weeks of postoperative bed rest without plaster the patient is usually allowed to get up and weight bearing is permitted

(6) Acta orthop. scand 255 269 1957

During 1947 55 Lindström operated on 41 hips by this method One patient died of cancer The others were reexamined on the average 2 years and 2 months after operation 38 showed bone union and 1 clinical ankylosis and freedom from symptoms Thus bone union was achieved in 95% and relief from symptoms in 97% Thirty seven patients returned to work ranging from housework to heavy factory work and farm labor

Figure 169 shows bridging of bone beginning in the frac tured femoral head of a woman aged 60 in whom the author s method was used. Previous nailing according to Sven Johansson had resulted in pain and radiographic examina tion had shown subcapital collum pseudarthrosis with upward displacement of the trochanter and caput necrosis The operation is recommended for patients with unilateral arthrosis deformans for those with slight changes on the other side also and for those in whom arthroplasty is planned or has been performed on the other side provided the lumbar spine is satisfactory and the range of movement of the knee good.

Total Resection of Femur Followed by Autoplastic Tibiofibular Graft by Reversal according to A Jung and M Boudin[7] (Strasbourg France) has previously been reported only three times (Sauerbruch 1922 Orth 1931 Van Nes 1948)

Man, 42, had had increasingly intense pain in the right leg for 10 years which had been diagnosed and treated as severe sciatica. A tumor in the upper half of the femur revealed by x ray was inter preted as chondroma. Biopsy (a deep section) showed no evidence of malignancy The remainder of skeleton showed no abnormalities An arteriogram demonstrated normal vascularization in the right thigh the tumor itself was very slightly vascularized. Rather rapid progression of the tumor in succeeding months (Fig 170) led to suspicion of malignancy despite the histologic diagnosis.

The patient refused amputation with disarticulation at the hip but accepted amputation with conservation of the thigh." After a course of x ray therapy the entire femur deep muscular layers at tached to the tumor and most of the soft tissues of the thigh were removed, with disarticulation at hip and knee. The incision was then extended on the outside of the leg to the malleolus. The external border of the fibula and the foot were freed, the foot was disarticu lated and both malleoli were resected 5 cm. above the tibiotarsal line. Finally the leg was turned back 180 degrees by abduction, and the

(7) Lyon chir 53 353-360, May 1957

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Fig. 1. —Bearing of bone in fracture femoral head. (Courtesy of Lindström, N. Acta orthop. scandinav. 2...

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(7) Lyon chir 53 353-360 May 1957

stump of the lower extremity previously rounded and shaped, was placed in the acetabulum. Muscles of the thigh and leg were joined by muscular and aponeurotic sutures so that the bones were surrounded by a muscular muff and excess skin was removed. Two drains were inserted and the skin of the thigh was sutured to that of the leg. The thigh was maintained in an abduction cast for 21 days. Total time of operation (all three stages) was 3 hours. Two liters of blood were administered and the patient displayed no signs of

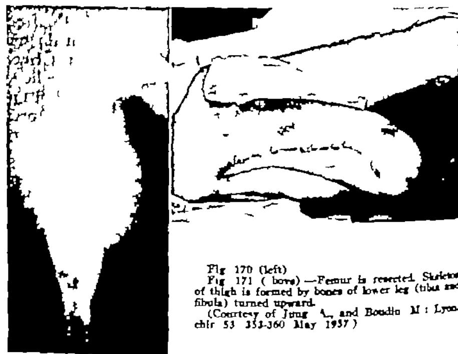


Fig 170 (left)
Fig 171 (above) —Femur is resected. Skeleton of thigh is formed by bones of lower leg (tibia and fibula) turned upward.
(Courtesy of Jung A., and Boudin M: Lyon chir 53 353-360 May 1957)

shock. Histologic study of the femoral tumor revealed chondrosarcoma.

Postoperative x rays showed tibia and fibula well adapted in the cotyloid cavity forming a favorable angle with the ischium. Arteriography a month after operation revealed that the popliteal artery had made a hairpin turn, with the vascular pattern of the lower leg in an unusual setting. There was no obliteration and branches were filled satisfactorily. An oscillogram showed reduction of amplitude of oscillations by one-half on the operated side as compared with the sound leg.

The patient's pain completely disappeared, but the thigh remained sensitive. His general condition and that of the stump (Fig 171) were excellent 17 months after operation, although prognosis remained guarded because of the nature of the lesion.

Restoration of Quadriceps Function in Neglected Tear of Patellar Tendon. A technic is described by H Kelikian

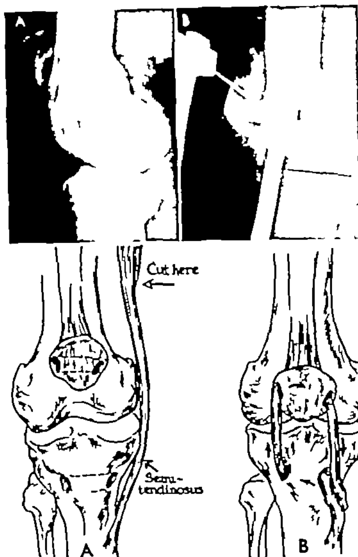


Fig. 172 (top) —Shift in position of patella. *A* preoperative position with knee in extension *B*, descent after bone and attached tendon were freed from femur and skeletal traction started with 10 lb. weight.

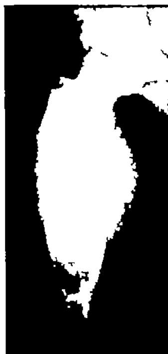
Fig. 173 (bottom) —Substitution of torn patellar tendon by tendon of semitendinosus *A* level of detachment of semitendinosus from muscular fibers; tunnels were drilled under tibial tubercle and through patella. *B* semitendinosus tendon is passed through drill holes and brought back and sutured to itself to complete circuit.

(Courtesy of Kelikian, H., *et al.* Surg. Gynec. & Obst. 104:200-204 February 1957)

Emile Riashi and John Gleason[8] (Chicago) In old unrepaired avulsions of the patellar tendon the quadriceps muscles undergo atrophy from disuse and the patella is pulled up on the femur later becoming transfixed to the front of that bone by firm fibrous bands Before attempting repair of

(8) Surg., Gynec. & Obst. 104:200-204 February 1957

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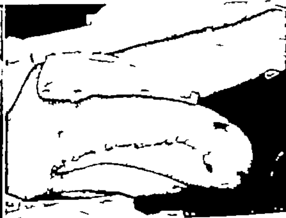


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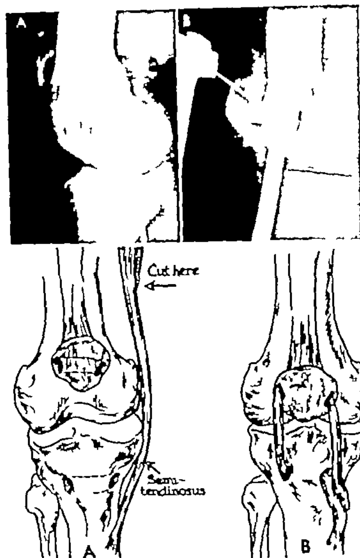


Fig. 172 (top).—Shift in position of patella. *A*, preoperative position with knee in extension. *B*, descent after bone and attached tendon were freed from femur and skeletal traction started with 10 lb. weight.

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(8) Surg., Gynec. & Obst. 104:200-204, February 1957.

the torn tendon the patella and the attached muscles should be mobilized and provision made for exercises and strengthening of the quadriceps

TECHNIC.—At a preliminary surgical sitting a sharp chisel is directed under the patella, all adhesions binding the patella and the quadriceps tendon are released and the wound is closed. A Kirschner wire then is passed through the proximal patella from side to side. Postoperatively this wire is hooked to 5-10 lb. weights to overcome the contracture of the quadriceps and enable the patient to practice quadriceps setting exercises against tension. When the quadriceps muscles have regained a measure of their lost power and, as ascertained by roentgenograms the patella has descended to an inch from the level of the superior articular surfaces of the tibia (Fig 172) the repair of the torn tendon is undertaken. The tendon of the semitendinosus is severed at the musculotendinous junction. The free end of the tendon is passed through a tunnel in the tibial tubercle going from the medial to the lateral side and then up to the drill hole in the patella through which it is threaded in reverse direction (Fig 173) The end then is brought down and sutured to its own stem or to a pedicle fashioned from one of the neighboring tendons the sartorius or gracilis which inserts in the same area on the tibia. The incisions are closed and the extremity is encased in a long cylinder cast incorporating the original Kirschner wire through the patella. Another transfixation pin may be inserted through the tibia farther down and it also may be incorporated in the cast. The cast and pins are removed in 6 weeks and functional exercises are started.

The authors report the case of a man, 45 who had had avulsion of the patellar tendon 2 years previously After treatment as outlined he had no pain in the knee no weakness in the thigh and was able to run and climb stairs without difficulty

Technic of Phlebography of Lower Limb Methods used in 1,219 phlebographies of 652 legs (509 cases) are described by Åke Gullmo[9] (Univ Clinics Lund) in the order found most suitable. About 20 ml of 35% contrast medium was used

METHODS.—*I Retrograde femoral phlebography*.—Before injecting the contrast medium, the patient is instructed to practice straining (Valsalva's maneuver) The needle is inserted in the inguinal fold immediately medial to the artery whose pulsations are best felt with the leg rotated outward. A large bore needle about 8 cm long with a straight cutting edge is used. Before being connected to the tube and syringe, it is introduced directly into the femoral vein. When the tip meets the fascia, the latter is penetrated by a gentle thrust. A rubber or plastic tube, about 25 cm. long is connected to

(9) Acta radiol. 46:603-620 October 1956.

the needle and physiologic saline injected suction will show whether the needle is still in proper position after the patient strains for a moment or so. The patient now takes a deep breath. After about 7-8 ml of the contrast medium is injected he is ordered to strain The medium is injected quickly but not at a pressure to involve the risk of extravasation The first film is obtained at the end of the injec



Fig. 174—Retrograde femoral phlebography Normal appearance. Injection during straining. Contrast filling extends to nearest peripheral valves. At → valve of superficial femoral vein. At single-tail arrows, valves of branches of deep femoral vein. At double-tail arrow contrast medium above proximal valve in long saphenous vein. (Courtesy of Gullmo, A. Acta radiol. 46 603-620 October 1956)

tion. The patient takes a shallow quick breath (during which valves of the veins, if any are transiently opened) and again strains A film of the lower segment of the thigh including the region of the knee and a third film of the lower leg are obtained.

Straining will not force the contrast medium past the first inguinal valves of a normal femoral vein, an observation confirmed by phlebograms taken in association with the injection of contrast medium in urographic examinations of 30 patients with normal legs. In all the result was the same as that illustrated in Figure 174

Retrograde phlebography is so informative that it should precede and supplement the other methods of examination It will usually show the individual type of insufficiency

II Ascending phlebography of the lower limb—With the patient sitting contrast medium is injected into any one of the superficial veins of the foot. A tourniquet is applied and the larger foot veins are filled first, after which the contrast medium passes up through the posterior tibial vein as well as through a practically regularly occurring anastomosis 2 3 fingerbreadths above the ankle, into the fibular vein. After about 10 ml of medium is injected, the first film is taken. Communicating veins (if incompetent) in the distal segment of the lower leg are visualized. Three films are obtained, with slightly increasing outward rotation of the leg to show communicating veins from the posterior tibial vein. Before lateral films are taken another 10 ml of medium is injected, after which the patient moves his foot two or three times energetically to contract the soleus muscle. The calf muscles are gently stroked distally to milk the medium down into the venous arches in the soleus muscle The draining capacity of the veins may be judged after further exercise of the foot. In the presence of hemodynamic disturbances or incompetence of the communicating or perforating veins the medium may persist for a long time in the muscle veins and incompetent communicating veins

Method III is applied when it is not possible to inject the contrast medium into a foot vein and for investigation of the veins of the gastrocnemius muscle

III Injection of contrast medium into a lower leg varix and compression of the superficial veins above the knee—A tourniquet is placed round the thigh. With the patient supine, the contrast medium flows into the deep veins even through incompetent communicating or perforating veins. If the medium is injected slowly the entire amount may enter the nearest communicating veins and flow up through the deep veins. To fill the superficial veins and other communicating or perforating veins within a larger region, the medium should be injected fairly rapidly Venipuncture is done with a large bore needle (at least 1 mm.) with the patient sitting on the edge of the table. When the needle has passed into the varix, blood is allowed to flow out onto a compress while the patient is in the supine position, the leg being supported by the examiner the escape of blood then usually ceases The needle is connected to the syringe with a short tube, which is fastened to the skin, and physiologic saline injected. A pad under the distal part of the thigh will lift up the calf and prevent compression of the veins of the calf against the table. Contrast medium (8-10 ml.) is injected, and the first film taken with the leg rotated 45 degrees outward. The patient extends and flexes the foot two or three times energetically to pump the contrast medium into the muscle veins Films are obtained of the leg in different positions of rotation the film in outward rotation is

the most important as it gives the best projections of the veins in the belly of the medial gastrocnemius muscle and the communicating veins entering the lower arch of the soleus muscle veins.

If mainly the veins in the gastrocnemius muscle are to be examined, the contrast medium is deposited into a varix at a higher level in the posteromedial part of the lower pole of the gastrocnemius muscle. The last films are taken of the thigh veins immediately after release of the tourniquet, during which the patient is instructed to strain to delay the flow of the contrast medium from the thigh veins and to demonstrate the valves more distinctly

Method IV may be used in the investigation of cases in which filling of the deep veins in the upper half of the lower leg popliteal vein or femoral vein cannot be obtained by other methods

IV Percutaneous puncture of the popliteal vein—Under local anesthesia, the needle is introduced into the popliteal vein with the patient prone. At times the vein may be distended by slight straining After the blood begins to flow the needle is connected to a tube and syringe. The position of the needle is checked by injection of physiologic saline and by suction. The first film is obtained after the injection of 5-6 ml. of contrast medium, preferably during its performance and followed by films at various angles. Some films are taken during mild straining to demonstrate the valves. Straining may cause retrograde filling of the deep veins in the lower leg and any pathologic communicating veins If the patient does not strain, the contrast medium will be rapidly drained, especially if the veins are of the narrow irregular type. In such veins the blood appears to flow fairly rapidly As the injection pressure exerts its effect directly in the deep veins the contrast medium mixes well with the blood and the vessels are distinctly delineated although the patient is recumbent.

Method V involves certain risks and is often unnecessary It is usually possible to inject the contrast medium into a suitable vein in venous insufficiency Injection into the marrow cavity is painful the pain being felt along the entire length of the bone injected If however the method is used the contrast medium should be deposited in the tuberosity of the 5th metatarsal bone.

V Transosseous phlebography—The bone and surrounding tissue should be anesthetized by the subcutaneous injection of, e.g., 1% xylocaine. A sternal puncture needle is introduced through the cortex of the tuberosity and by means of a collar fixed about 10 mm. from the tip of the needle the skin is pressed hard against the periosteum. This prevents paraosseous spillage. If the tip of the needle is in the marrow cavity the injection of the contrast medium requires little pressure. Xylocaine should not be injected into the marrow cavity because this would be practically the same

jecting it intravenously As a rule, the contrast medium flows from the 5th metatarsal bone directly through the posterior tibial vein. The rest of the examination may be done as in method II

Proximal Fibula Indications for Excision and Use are given by R. A. Murray and H H Brindley[1] (Temple Tex.) Local resection of the fibula is a relatively simple uncomplicated treatment for pathologic lesions occurring in the bone itself or for adjacent lesions in which removal of the fibula allows ease of approach or exposure of the area Lesions amenable to treatment by local resection of all or part of the proximal fibula are benign tumors of the fibula often associated with symptoms of peroneal palsy (Fig 175) resectable malignant tumors of the fibula osteomyelitis of the fibula ununited tibial fractures with an intact fibula short below the knee amputation stumps with prominent or too long a fibula painful ununited fracture of the fibula exposure of the posterolateral tibial plateau exposure of an arteriovenous fistula between the anterior tibial and peroneal vessels and in peroneal nerve repair to gain length

The fibula except for the head consists entirely of cortical bone therefore it is revascularized more slowly Under most circumstances a fibula bone graft should not replace cancellous iliac bone grafts or partially cortical and cancellous tibial grafts However when a long cortical graft is required to replace a massive segmental loss in a cortical shaft, the fibular graft offers several advantages over the tibial or iliac graft. These are almost exact replacement of the defect in size ease of fixation with screws or intramedullary nails and absence of complications associated with the donor area. The fibula can be used to replace the distal end of the radius the proximal humerus or the distal fibula including the articular surface (Fig 176)

With use of a massive graft, the complication most often encountered is late fatigue fracture before complete revascularization and bony replacement has occurred. This complication may be avoided by prolonged support though it is difficult to be certain when support may be safely discarded In addition prolonged immobilization promotes stiffness of joints muscle atrophy and poor functional re-

(1) South. M. J 50.297 302, March, 1957



Fig. 175 (top) —X-ray films show no recurrence f benign giant cell tumor 15 years after proximal fibula resection.

Fig. 176 (bottom) —Two years after fibular graft replacement for benign giant cell tumor of radius, functional result was excellent.

(Courtesy of Murray R. A., and Brindley H. H. South M.J 50:297 302, March, 1957.)

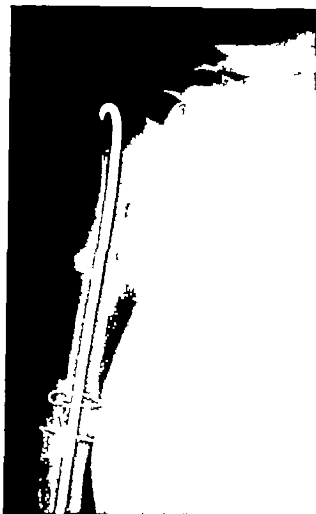


Fig 177.—Replacement of proximal humerus with fibular graft and intramedullary nail in patient who had chondroma of head f humerus. F tigue fracture occurred 6 months after operation. (Courtesy of Murray R. A., and Brindley H. H.: South M J 50:297 302, March, 1957)

sult. If a late fatigue fracture occurs the position is held *and union may occur without further treatment being nec* essary (Fig 177)

Surgical Repair in Recurrent Dislocation of Ankle Joint. Recurrent dislocation of the ankle usually originates with a severe sprain of the lateral ligament Sometimes the cause is a relaxed lateral ligament or instability of the ankle joint subsequent to surgical treatment of another lesion The manifestation pathognomonic of the lesion is abnormal tilt *ing of the talus in the joint mortise on plantar flexion and*

inversion of the foot at the subtalar joint (Figs 178 and 179)

Mild cases may be controlled by a shoe that is built up on the outer side to evert the foot slightly and by strengthening of the peroneal muscles through exercises In severe cases the patient must choose between permanently wearing a boot with an iron and having surgery Operative reconstruction should always be considered when the patient is a young active adult or when his occupation depends on a



Fig. 178 (left) —Preoperative x ray shows tilting of talus in ankle joint mortise when foot is inverted and plantar flexed.
Fig. 179 (right) —X-ray 5 years after operation shows no abnormal tilting of talus. (Courtesy of Lee, H. G. J Bone & Joint Surg. 39-A:828-834 July 1957)

stable ankle. Harold G Lee[2] (Boston) uses a modification of the classic Watson Jones operation of tenodesis with reconstruction of the external lateral ligament. The method provides greater protection against inversion of the foot by a firm sheet of fascia and retinaculum turned down as a flap and anchored over the newly constructed ligament

TECHNIC.—An incision is made on the posterior aspect of the lower portion of the leg following the outline of the peroneal tendons and extending downward to the margin of the cuboid (Fig 180) The peroneus brevis tendon is divided, after being stripped from its muscle belly to obtain sufficient length of tendon to construct the new ligament. The distal portion of the peroneus brevis tendon is freed as far down as the superior peroneal retinaculum, care being taken not to disturb these annular fibers.

(2) J Bone & Joint Surg. 39-A:828-834 July 1957

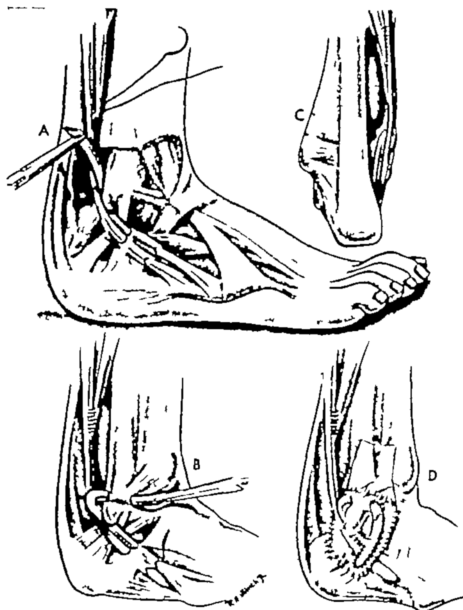


Fig 180 —*A* division of peroneus brevis tendon. *B* suture of peroneus brevis muscle fibers to peroneus longus, and distal end of tendon passed through drill hole in external malleolus. *C* posterior view *D* suture of peroneus brevis tendon to itself and to sheath of peroneus longus fascial flap, stripped from above, is sutured over newly constructed ligament. (Courtesy of Lee, H. G J Bone & Joint Surg 39-A: 828-834 July 1957)

A horizontal drill hole ¼ in. in diameter is made in the lateral malleolus, just below its broadest part. The detached peroneus brevis tendon is threaded through the hole from back to front, and its end is carried downward to below the lateral malleolus where it is attached to itself and to the sheath of the peroneus longus. While this

attachment is being made the foot is held in the corrected position of valgus.

A flap of fascia from the lower portions of the fibula and tibia is folded downward and attached at its circumference to the surrounding tissues. The wound is closed, and the foot in the right angled position and in slight valgus is immobilized by a plaster boot equipped with a weight bearing sole. Immobilization is continued for 6 weeks. Weight bearing is permitted after 10 days.

Lee treated 7 patients with chronic instability of the ankle by this method Results were good in all

► [The method described and used by Lee is similar to the technic recommended by Watson Jones. The variation which Lee recommends would seem to have some merit.—Ed.]

Subtalar Extra articular Arthrodesis Preliminary Report of Method of Stabilizing Feet in Children is presented by G Wilbur Westin and Cameron B Hall[3] (Shriners Hosp

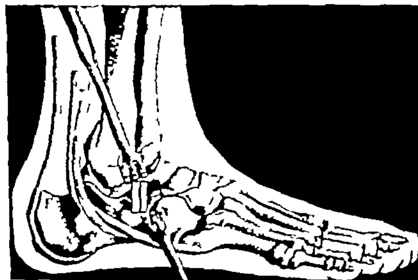


Fig. 181 —Placement of tibial grafts in subtalar extra-articular arthrodesis. (Courtesy of Westin, G. W., and Hall, C B : J Bone & Joint Surg. 39-A:501 512, June 1957)

for Crippled Children Los Angeles) The surgical procedure used was basically the same for all types of deformity Tibial grafts were inserted in slots in the roof and floor of the sinus tarsi so that their vertical axes were parallel to the long axis of the tibia when the foot and ankle were in neutral position (Fig 181) When indicated by muscle imbalance tendon transplantations were carried out in a conventional manner In 62 stabilizations there were not any fatalities

(3) J Bone & Joint Surg. 39-A:501 512, June, 1957

or infections and no absorption of the bone graft occurred

Thirty-one patients with paralytic flatfoot (Figs 182 and 183) were treated by subtalar extra articular arthrodesis In patients with tight heel cord the Kite method of wedging plaster casts was used to obtain correction The foot was held in maximum inversion until the equinus deformity of the talus was corrected Then bone grafting was done and

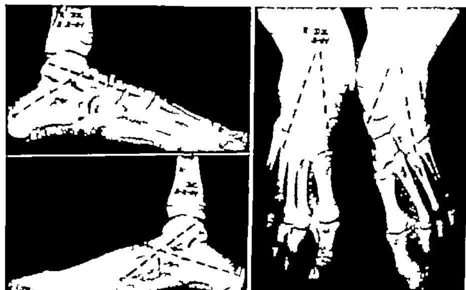


Fig 182 (left) —Paralytic flatfoot in patient aged 12 result of poliomyelitis at age 6. Anterior and posterior tibial muscles of left leg were rated zero other muscles of legs and foot were normal and right lower extremity was not involved. Lower view shows fixed equinus deformity of left foot.

Fig 183 (right) —Anterior x-ray of both feet, showing posterior and lateral displacement of all tarsal bones in relation to talus in left foot

(Courtesy of Westin, G. W and Hall, C. B J Bone & Joint Surg. 39 A 501 512, June, 1957)

the strong peroneal muscle was transplanted forward along the midline of the foot to the 2d cuneiform bone (Fig 184) or to the base of the 2d metatarsal Results were cosmetically and functionally satisfactory in 25 patients

Calcaneovalgus feet were treated in 13 patients After transplantation of good muscle power to the calcaneus 10 were able to discard their braces

Flail or partially flail feet with no muscle imbalance were treated in 13 patients Subtalar extra articular arthrodesis should not be done when flail foot is in a varus position but is indicated in very weak feet with marked valgus deformities as a result of weight bearing These weak or flail feet

may require triple arthrodesis later when bone growth is complete but this major procedure can often be prevented if subtalar arthrodesis is performed when the deformity is first recognized

The subtalar procedure was performed on 2 patients who had marked painful flatfoot with no paralytic involvement on 1 patient with a congenitally vertical talus and on 2 pa-

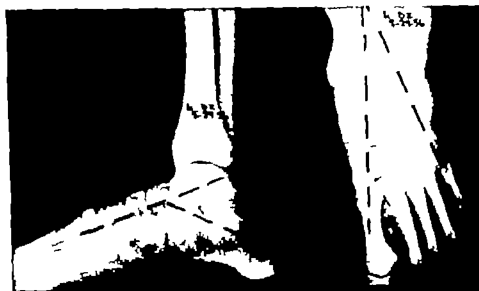


Fig. 184—Same case of paralytic flatfoot, 2 years 3 months after subtalar arthrodesis and transplantation of peroneus longus to 2d cuneiform bone. (Courtesy of Westin, G. W., and Hall, C. B J Bone & Joint Surg. 39-A 501 512, June 1957)

tients who had previously been treated by multiple tendon transplantations

Extra articular subtalar arthrodesis should not be done indiscriminately on asymptomatic flat feet In patients with flatfoot resulting from paralysis however the normal architecture of the foot may be restored and maintained by this operation

Two-Stage Stabilization Procedure for Correction of Calcaneocavus is presented by George E Scheer and C H Crego Jr[4] (Shriners Hosp for Crippled Children St Louis) The operation consisting of removal of a posterior bone wedge from the subtalar joint allows rotation of the calcaneus to a more horizontal position and restores heel length

(4) J Bone & Joint Surg 38-A 1247 1253 December 1956.

TECHNIC.—The patient is placed in the prone or lateral modified Sims position, and a 3-in. incision along the medial border of the Achilles tendon is made proximally from the point of insertion. The tendon is retracted laterally and the incision continued along the capsule of the subtalar joint and the superior surface of the calcaneus. The flexor hallucis longus is identified and retracted medially the neurovascular bundle being protected. The posterior portion of the capsule is resected, and the superior aspect of the posterior tuberosity of the calcaneus denuded Two narrow-bladed, straight

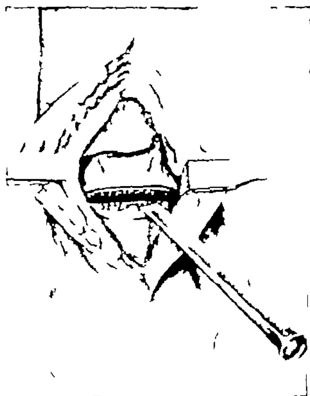


Fig. 185.—After talocalcaneal joint has been excised (Courtesy of Scheer, G. E., and Crego, C. H. Jr J Bone & Joint Surg. 38-A 1247 1253 December 1956.)

Crego retractors are introduced alongside the joint, and a wide exposure is secured. The joint is excised, the major portion of bone removed being taken from the calcaneus (Figs. 185 and 186) The size of the wedge is determined by a study of the preoperative x rays. If a varus or valgus deformity co-exists the shape of the wedge can be altered in order to correct these deformities.

The gap is closed by upward pressure exerted on the heel This rotates the calcaneus into a more horizontal position which eliminates the necessity for elongating the heel by shifting the foot posteriorly At this point, the forepart of the foot is in a marked equinus position. Cancellous bone chips from the removed bone are then packed into and about the remaining portion of the excised

joint. As only one joint has been excised, stability is easily obtained. Desirable posterior tendon transfers to the calcaneus may also be done at this stage, but care must be taken not to undermine too widely the skin flaps. Also it is not wise to transfer anterior tendons through the interosseous space at this time. The incisions are closed loosely and the extremity is immobilized in a long plaster cast.

The 2d stage is performed 4 weeks later. A plantar fasciotomy or Steindler stripping is done first, after which an incision is made on the dorsolateral aspect of the foot, overlying the sinus tarsi. The contents of the sinus tarsi are enucleated; the capsule and capsular ligaments are stripped from the head and neck of the talus and the talonavicular joint is opened. A wedge, with its base superior, is

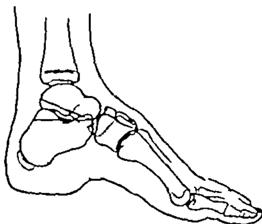


Fig. 186.—Lateral view of talocalcaneal wedge to be removed. (Courtesy of Seber, G. E., and Crego, C. H., Jr.: J. Bone & Joint Surg. 38-A 1247-1253, December, 1956.)

removed from this joint. Similarly, the calcaneocuboid joint is exposed and excised. The gaps are then closed, the cavus and equinus deformities of the forepart of the foot being thus corrected. Any desirable anterior tendon transfers, including a Jones suspension, may be done at this time. The extremity is immobilized in a plaster cast for 6 weeks. Immediate postoperative care is necessary to minimize complications due to pressure within the cast.

Early results were classified as satisfactory if the deformity had been corrected and heel length restored, if solid painless fusion of all 3 joints had been obtained and if the foot could be fitted with normal shoes. On this basis results were satisfactory in 21 feet and unsatisfactory in 3. None of the patients has had a recurrence. A major complication occurred in only 1. There were no infections.

INSTRUMENTS, APPLIANCES AND BONE BANKS

Experimental Evaluation of Divided Rolling Mattress for Spinal Traction Gerold Klein[5] (Garfield Mem l Hosp) conducted tests to prove that the commonly used bilateral leg traction with or without countertraction does not produce the desired effect Friction between patient and mattress prevents the transmission of the traction force of the weights to the spinal lesion

The friction obviously must be eliminated if traction is to become effective at the spinal level Methods of separating the mattress from the patient are neither practical nor comfortable However a simple unit can be constructed by taking advantage of the friction between patient and bed The unit patient plus mattress can be placed on rollers which slide on the underlying bedboard with a minimum of friction and the pulling force applied to any level of the unit will be transmitted with a minimum of loss to any region desired.

METHOD —A plaster mold of a human body is made, with the same contact surfaces as a patient in bilateral leg traction. The mattress is placed on rollers and divided under the hypothetical spinal lesion at the same level as the division in the plaster body lying on the mattress (Fig 187) Thus, the portion of the body caudal to the lesion and the caudal part of the mattress form the caudal unit and the cranial portion of the body with the cranial part of the mattress forms the cranial unit. Both units slide separately with their rollers on the horizontal basal bedboard in the direction the pulling force is applied. This method transmits 80% of the weight traction to the desired level of the spine compared to 0% by the commonly used methods. The level of the spine on which traction should be centered can be selected by placing the division line at the desired level

The divided rolling mattress makes it possible to eliminate the discomfort caused by attaching weights to the legs and head. By raising the basal bedboard at the line corresponding to the division of the mattress the cranial and caudal units rest on two oppositely declining planes. The weights of the two units now rolling in opposite directions produce a distracting force at the division of the mattress and, because of the friction between patient and mattress also at the spinal level above it. Any desired amount of traction can be obtained

(5) M. Ann District of Columbia 25 651-654 December 1956.

by changing the angles of declination The attached weights thus become unnecessary

The angulation of the sliding planes results in hyperextension of the spine at the level to which traction is transmitted. This is sometimes desirable in flexion fractures and certain neural irritations. Other types of spinal lesions, however demand traction with the patient in horizontal or flexed position.

To obtain flexion without losing the traction effect a pair of ply wood boards may be attached by hinges under the centrally divided mattress at the line of division The rollers are placed under these attached boards. The patient is flexed by elevating the head and foot ends of the two mattress parts from the attached boards with angulation at the hinges The traction effect of the units is maintained

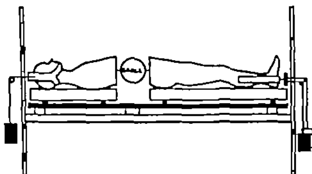


Fig. 187 —Mattress placed on rollers and divided under hypothetical spinal lesion, with scale between divided parts of plaster body with caudal and cranial traction. (Courtesy of Klein, G. M Ann. District of Columbia 25 651-654 December 1956.)

by the attached boards which remain rolling in opposite directions on the declining planes

Since friction between patient and mattress has an arresting effect only on horizontal or moderately angulated mattress parts extreme elevation to obtain increased hyperflexion may cause gliding of the patient on the mattress surfaces toward the level of flexion. The traction effect of the divided rolling mattress may be diminished or eliminated at the spinal lesion Extreme hyperflexion is provided by leaving the cranial part of the patient horizontal and elevating only his caudal part to the desired flexion angle. Gliding is prevented by flexing the knees over a downward angulation in the caudal part of the mattress. Extreme hyperflexion of the patient is obtained, with the traction effect of the divided rolling mattress fully effective at the spinal lesion.

Ten Years Experience with One-Man Bone Bank is presented by Ralph B Cloward[6] (Honolulu) Two important factors are to be considered in use of cadaver bone (1) the need to preserve the osteoblasts and other bone cells which

(6) J Internat. Coll. Surgeons 28 110-117 July 1957

would grow and (2) positive assurance that the bone is sterile. The most suitable bones for banking come from the bodies of young persons who have died suddenly or after a short illness To insure sterility it is important to remove the bones from the cadaver by an aseptic surgical procedure, in an operating room The cutting and processing of the bones should also be performed in a room with a sterile atmosphere

After the bones have been cut into the desired sizes and shapes, they are placed into Mason jars filled with irradiated pooled plasma. The lids are screwed on tightly and the jars placed in an incubator or left at room temperature for 3 hours or longer Any bacteria that may contaminate the specimen grow rapidly and readily in the plasma The jars are removed from the incubator to the culture room where the lid is reopened and samples removed and implanted on culture mediums Test tubes of brain broth and blood agar Petri dishes are prepared from each jar of bone. Cultures are placed in the incubator and the bone jars after secure replacement of the lids are placed in the refrigerator for storage A small deep-freeze unit with a temperature of about 10 F is used for storage The plasma and bone combination is thus frozen solid in which condition it remains until used at operation

The cultures obtained from the individual bone bottles are read daily for possible bacterial growth indicating contamination If neither cultures nor smears show evidence of bacterial growth after 10 days in the incubator the bone bottle is marked sterile and is ready for use. If some bacterial growth is present the bone bottle is removed from the freezer thawed out at room temperature reincubated and recultured If the second cultures are contaminated the bone is discarded

Banked bone assures grafts of ample quantity and size. Another advantage is the ease of transportation from place to place For short distances the bone bottle can be carried with the surgical instruments for longer distances the bone can be transported in a small package containing dry ice

Bone Implants Preliminary Report of Experimental Study Robert D Ray and Jon A Holloway[7] (Univ of Washington) compared the rate of healing of trephine defects in the parietal bones of 21 rats (42 defects) after implantation of (1) frozen homogenous bone (2) inorganic bone salts prepared by deproteinizing homogenous bone and (3) organic bone matrix prepared by decalcifying homogenous bone Results were observed 6 weeks after implantation

After implantation of frozen homogenous bone it was found roentgenographically that one third of the trephine defect was filled with new bone in 2 of 18 rats minimal bone proliferation was observed in the other 16 On histologic examination in some places the margins of the implants were covered with new bone in other areas there were clusters of round cells and multinucleated giant cells Apparently active resorption of the implants was taking place

The 12 defects in which deproteinized bone was implanted failed to show more than minimal amounts of new bone formation roentgenographically Histologic sections revealed that in some the implants were incorporated into the narrow margin of new bone formation around the edge of the defect There was minimal foreign body reaction

After implantation of decalcified bone matrix in 12 defects complete bridging with new bone occurred in 5 two thirds of the defect was filled with new bone in 2 and one third in 4 and minimal evidence of repair was seen in 1 Histologically the implanted fragments were well incorporated in the host bone and endothelial elements had invaded most of the fragments There was no appreciable foreign body reaction

Of the various materials used the best substitute for fresh autogenous bone grafts (if mechanical factors are not a consideration) appears to be the organic matrix of bone devoid of its inorganic salt. Apparently successful replacement of an implant depends on the readiness with which it can be invaded by vascular elements Presence of inorganic salts in the implant appears to impede the process of replacement rather than to accelerate it. Whether any anti-

(7) J Bone & Joint Surg. 39 A 1119-1128 October 1957

genic factors are present in decalcified matrix implants or whether the organic matrix can be further fractionated has not yet been determined

Regenerative Ability of Autoplastic and Deep-Frozen Homoplastic Transplant of Bone Comparative Experimental Study is reported by S Vainio and K Solonen[8] (Lahti Finland) Histologic observations of fresh autoplastic compact transplants covered with periosteum revealed that as early as 2 weeks after operation a vivid reossification is taking place on the surface of the fragments and of the graft The calluses unite over the junction line. The periosteal and the medullary calluses tighten rapidly The graft unites early with the host bone. Its regeneration and transformation take place with relatively little effort. It was thought that part of the graft per se remains a part of the regenerated bone

In deep-frozen homoplastic transplants, the histologic reaction of the fragment is the same as in autotransplants Regenerated bone does not develop on the surface of the homotransplant and a powerfully proliferating connective tissue erodes its surface The homotransplant unites with the host bone more slowly For example 2 weeks after operation a preparation could not in general be produced in which the graft adhered to the host bone When loose it escapes in the water At a later stage of regeneration the medullary and the periosteal calluses erode and replace the transplant The histologic features give the impression that the regeneration calls for great effort on the part of the regenerating tissue. The transplant so to say takes up a negative attitude toward the regenerative efforts of the surroundings A homotransplant becomes infected more easily than does an autotransplant

Viability of Preserved Bone was studied by S L Haas[9] (Stanford Univ) Bone preserved in citrated blood possessed the longest survival period of osteogenic cells and exhibited the greatest power of proliferation of these cells Bone preserved in autogenous blood showed less osteogenesis than bone kept in homologous blood Temperature of about 5 C was optimum for preservation of osteoblastic

(8) Ann chir et gynaec Fenniae 46 222 234 1957
(9) Surg Gynec & Obst. 105 449-456 October 1957

activity Temperature approaching —30 C inhibited osteogenic activity of the transplanted bone. There was a decrease in osteogenesis and viability with increase in time of preservation Serum was not a good preservative medium Autogenous bone that is used at once offers the greatest chance for a successful result when a graft of bone is necessary

Biophysical Investigations of Bone Transplants Fresh autogenous and homogenous bone transplants placed in the tibia of the rabbit were studied by Kaj Holmstrand[1] (Karolinska Inst., Stockholm) for 1 year after operation with biophysical methods comprising microradiography x ray microdiffraction autoradiography and examination in polarized light. The absorption and replacement of mineral salts was quicker in the autogenous transplants The amount of minerals in the callus in a series of fresh cortical autogenous and homogenous transplants during different healing in times was determined by quantitative microradiography combined with thickness determination of the examined specimens Calcification was initially quick and thereafter progressed slowly No difference between the autogenous and homogenous transplants with the same healing in time could be observed

By turning the cortical transplants perpendicular to the longitudinal direction of the host bone it was shown that the substituting bone retained the ultrastructural organization of the original transplant However a cancellous transplant was rebuilt to match the orientation of the host bone In contradistinction to the cortical bone a cancellous autogenous bone transplant does change its structure to correspond to the host bone in which it is implanted Therefore, it seems the ultrastructure of the bone replacing the transplant depends not on forces from mechanical stress but has to be referred to some intrinsic factor such as the direction of the vessels from the host bone invading the transplant Provided the same law holds for human transplants it is apparent that cancellous transplants are best for reconstruction of bone defects for which quick adaptation is important.

(1) Plast. & Reconstruct. Surg. 19:265-282, April, 1957

Transplantation of Bones Advantages and Disadvantages of Different Methods are presented by F Betzel[2] (Bochum Germany) Success or failure of bone grafts depends on technic and biologic behavior of the site of the graft. Therefore, it is not possible to declare a certain method the technic of choice the technic that best suits the individual problems must be chosen New bone formation and thus the success of a bone graft depends on the area and surrounding soft tissues into which the bone is being transplanted, transplanted bone relation of transplant to site of transplantation and its surroundings aseptic technic and static mechanic conditions

It is important that the graft site be well preserved and handled carefully because it has to provide the blood supply and nourish the new bone Scar tissues should be removed from the site of transplantation The periosteum plays an important role as it provides nourishment for the transplant and protects it from adhesions to the surroundings. The periosteum will fulfil its task as long as it remains in contact with the surrounding musculature, which is the main nutrient of the new bone.

Banked homologous bone tissue closely approaches the qualities of an autotransplant. Deep freezing is probably the best way to preserve the banked bone. It is felt that notwithstanding its qualities the banked bone will not replace entirely the fresh homologous bone used in autotransplantation biologically the latter will always be the most closely related to the tissues of the recipient site and thus insure fast and lasting take'

Transplantation of periosteum alone will not produce a new bone Cancellous bone has been used by many as bone replacement The author uses cancellous bone mostly to fill in bone cavities (after emptying of bone cysts) and to fill pseudoarthrosis spaces Cortical bone the most commonly used transplant is usually taken from the tibia It has good osteogenic regenerative properties may have supportive splinting action and may strengthen the graft site permanently

Inlay graft is used generally in pseudoarthroses where there is extensive scar formation around the much sclerosed

(2) Deutsche med. Wchnschr 81 2016-2024 Dec. 14 1956.

fracture ends Onlay grafts are performed in certain forms of pseudoarthroses and in delayed healing of fractures With both inlay and onlay grafts it is important that the transplant adhere widely and in its entire length to the bony graft site the surface of which should be smooth

Radioactive Calcium Tracer Studies in Bone Grafts Jonathan Cohen Constantine J Maletskos John H Marshall and James B Williams[3] (Boston) studied homogenous bone grafts in dogs by implanting radioactive bone from donor dogs previously given an injection of radioactive calcium (Ca^{45}) and by implanting nonradioactive bone into hosts given an injection of Ca^{45} before during or after grafting Samples of blood were taken at intervals up to the time of killing and were analyzed for specific activity After the dogs were killed sections from the graft callus and nearby bone were analyzed for Ca^{40} (stable calcium) and for Ca^{45} Adjoining sections were examined histologically and autoradiographed and the films were analyzed quantitatively for localized values of specific activity by means of a microdensitometer

The activity in cross sections of the shafts of the long bones consisted principally of a general diffuse component the specific activity of which was relatively constant over the 100-day study period and was proportional to the administered dose. On this diffuse component were superimposed a few intense hot spots and often a ring of increased activity in or near the endosteum or periosteum The hot spots corresponded to individual haversian systems and their specific activities ranged up to 35 times that of the diffuse component as determined with an autoradiographic resolution of 120 μ.

The distribution of Ca^{45} from radioactive grafts was systemic and no preferential transfer of Ca^{45} to callus or nearby bone was detected In dogs receiving nonradioactive grafts and injections of Ca^{45} the specific activity of the callus was the highest observed anywhere in bone (up to 100 times that of the diffuse component of the host s cortical bone) and was strongly dependent on the relation between time of injection and the time of grafting The time of calcification of callus occurred predominantly at about the 3d week

(3) J Bone & Joint Surg 39-A 561 577 June, 1957

after grafting Relocation of localized deposits of activity without dilution in the whole volume of circulating blood (hot spot migration) to or from graft areas was not detected in this experiment.

The data of the experiment provided two points pertinent and applicable to the problem of radiation hazard evaluation with respect to radioactive materials fixed in bone (1) the proportionality between the administered dose and the specific activity of the diffuse component and (2) the large ratio between the specific activity of hot spots and that of the diffuse component

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CALCIUM AND PHOSPHORUS DISEASES OF BONE

Chronic Hypercalcemia and Vitamin D in Early Childhood Postmortem Studies Lars Hjelt Hilkka Tahka and Niilo Hallman[4] (Helsinki) report autopsy observations in 2 children with chronic hypercalcemia One had received 13 intramuscular injections of 500 000 I U of vitamin D_3 for a little more than 2 years the other had 4 injections during 14 months

Calcification in the blood vessels particularly in the media, was found in both children In the child given the larger vitamin D dosage most renal glomeruli were destroyed. In both children the tubules were filled with calcium and a hyaline mass with calcification in the basal membrane of the epithelium The child who had received more vitamin D and who had a healthy twin brother treated with almost the same amount of vitamin D had a dilated kidney pelvis and a dilated collateral ureter The glomeruli of the other patient were structurally infantile.

Metastatic calcifications were seen in the gastric mucosa, lungs and heart of both patients The heart valves of the child receiving the smaller vitamin D doses were thick, stiff and calcified which accounted for the long blowing systolic murmur heard before death The bone findings suggested osteosclerosis Both children had normal parathyroid glands

(4) Ann. pediat. Fenniae 2 75-93 1956.

In both, the findings agreed best with features found in hypervitaminosis D and there were also resemblances to the severe form of so-called idiopathic hypercalcemia

Familial, Primary, Vitamin D Resistant Rickets (Phosphatdiabetes) is reported by R. Tobler, A Prader and W Taillard[5] (Univ of Zurich) Among 16 patients the most impressive sign was bent legs Commonly the femora bend forward Severe forms show deformity of the tibia also The legs become O or X shaped or occasionally show tackle deformities Involvement of the upper extremities is rare Severe deformities of the chest, clavicle and spine are rare Most patients were short mainly due to shortening of the lower extremities The general condition in children is usually little affected. The commonest complaint is easy fatigability on walking Pain is rare. Only 1 patient had muscular hypotony X-ray changes are most pronounced in the lower extremities

The disease is often familial and does not appear before the end of the 1st year of life. Vitamin D is effective only in daily doses of 50,000 units or more Discontinuation of vitamin D medication is followed promptly by relapse, and treatment must be continued during the entire growing period having the characteristics of substitution therapy The serum phosphate level remains low even with improvements in clinical course and x ray appearance. Normal phosphate levels were achieved only with toxic doses of vitamin D Osteotomy with subsequent immobilization can lead to chemical and radiographic healing of the rickets to a great extent even without vitamin D but only at cost of an osteoblastic osteoporosis During bed rest vitamin D must be discontinued as the hypercalcemic action of both immobilization and vitamin D might lead to calcium intoxication

Differential diagnosis must include deficiency rickets rickets secondary to steatorrhea renal rickets and hypophosphatasia Of greatest practical importance is exclusion of various forms of bowed legs not due to rickets Vitamin D resistant rickets is an inborn error of metabolism the exact nature of which is still little understood

Primary Vitamin D Resistant Rickets III. Biophysical Studies of Skeletal Tissue from 4 patients were made by

(5) Helvet. paediat. acta 11:209-255 September 1956.

Bengt Engfeldt R Zetterström and J Winberg[6] (Karolinska Inst. Stockholm) As in an earlier investigation the histologic findings in the costochondral junctions were those suggestive of severe human rickets However the cross-section from compact bone (a portion of the tibia) from a patient treated with high doses of vitamin D showed a pat



Fig 188.—X ray on hospitalization. Note rachitic changes in growth zones and abnormal structure of diaphysial bone. (Courtesy of Engfeldt, B *et al.*: J Bone & Joint Surg. 38-A 1323-1334 December 1956.)

tern not consistent with rickets there was a tendency toward formation of a mosaic structure resembling that seen in Paget s disease. Such changes were also noted in the bony part of the rib from a biopsy specimen taken before treatment was started

As demonstrated earlier the abnormal texture of the diaphysis of the long bones seen on clinical roentgenographic examination (Fig 188) was not normalized by a treatment

(6) J Bone & Joint Surg 38-A 1323-1334 December 1956.

with massive doses of vitamin D Despite almost normal mineralization, the lack of normal compact bone was estab lished by microradiography of a specimen of bone from a tibia after vitamin D treatment. The bone structure was abnormal, with an enormous variability of calcium content in different areas Although increased mineralization was seen roentgenographically microradiography revealed the same structural abnormalities that were seen in the skeletal tis sue of patients not treated with vitamin D

This finding supports the assumption that vitamin D even in extremely large doses has no direct effect on the skeleton in vitamin D resistant rickets. The deposition of mineral salts after treatment with vitamin D is only sec ondary to increase of the calcium phosphorus product of serum Vitamin D results in deposition of mineral salts in the skeleton but since the abnormal structure of the bone tissue is not normalized vitamin D does not cure the disease

In some areas with low calcium content and in areas with high mineralization the bone tissue in vitamin D resistant rickets showed much wider calcium free regions around the osteocytes than is seen in normal bone. Around some osteo cytes the border of the calcified tissue was not sharply de fined as in normal bone but irregular and indistinct A simi lar pattern has been noted in experimental hyperparathy roidism in dogs The findings were the same in all patients whether or not treated with vitamin D The authors con clude that vitamin D resistant rickets is a well defined genetically determined clinical and pathologic entity different from ordinary rickets

Vitamin D Resistant Rickets was observed by Neil N Litman Robert A Ulstrom and W Wilbur Westin[7] (Los Angeles) in 10 patients The usual clinical manifestations are similar to those of vitamin D-deficiency rickets Both probably begin within the first year Deficiency rickets usu ally is diagnosed early whereas resistant rickets is rarely diagnosed in a patient under age 1 None of the authors patients was under age 2 In both kinds of rickets the first symptom usually noted is bowing of the legs with concomitant shortening of stature The bowing may be in a medial

(7) California Med. 86 248-253 April, 1957

anterior or most often lateral direction Cranial bossing beading of the ribs and enlargement of the knees wrists and ankles also may be present.

In the very early stages rickets cannot be detected roentgenographically especially if the x rays do not include the distal parts of the lower extremities at the time of evaluation of bowed legs, since the earliest changes occur at the site where the bone growth is most rapid The first x ray changes occur at the epiphysial plate. Normally the plate is sharply defined In rickets however there is a frayed appearance at the metaphysial epiphysial junction that is caused by irregular osteoblastic deposition of bone salt resulting from continued but disorderly resorption of the cartilaginous osteoid tissue in this rapidly growing area. The commonest sites of such involvement are the distal femur and the distal ends of the ulna and tibia As the rachitic process continues demineralization of the shaft occurs owing to loss of lime

Blood chemistry study showed decreased serum phosphorus concentration and elevated alkaline phosphatase activity Blood calcium levels may be normal or slightly depressed Vitamin D resistant rickets must be differentiated from congenital abnormalities of the lower extremities such as femoral bowing coxa vara coxa valga and bony defects associated with dimpling of the overlying skin Chondrodystrophy and osteochondrodystrophy in their early forms also may simulate vitamin D resistant rickets These other conditions are not associated with abnormalities in the blood concentrations of calcium phosphorus and alkaline phosphatase nor do they respond to vitamin D therapy Lead poisoning in its chronic form has at times been associated with aminoaciduria, hypophosphatemia and rachitic changes in the bones Satisfactory clinical healing of the rachitic lesions in uncomplicated vitamin D resistant rickets usually is achieved with daily use of 50 000-150 000 units of vitamin D

The earliest response to treatment can best be evaluated by x ray films There will be a linear increase in density in the rachitic metaphysis at the rapidly growing ends of the long bones which results from increased and more orderly

deposition of bone salt in this area and eventually progresses to a broad dense transverse line.

Idiopathic Hypercalcemia is described by J A Shiers E. B D Neuhauser and J R Bowman[8] in 4 patients 1 of whom was also a cretin The clinical features may be attributed to raised serum calcium level, changes in organs damaged by prolonged hypercalcemia and probably associated abnormalities Elfin facies muscular weakness anorexia vomiting constipation and failure to thrive associated with mental retardation and deterioration may suggest the diagnosis Roentgenograms show widespread osteosclerosis evidence of defective bone formations and abnormal soft tissue calcifications

Osteosclerosis involves all bones and is particularly apparent in the base and frontal regions of the skull vertebral bodies carpal bones and epiphyses and ends of the shafts of the long bones It seems to affect mainly the spongiosa for the bony cortex appears normal or sometimes slightly thinned. The increase in bone density may be amorphous as in the base of the skull or due to thickening and coarsening of the individual trabeculae and is not associated with disturbance of the trabecular pattern

The osteosclerotic changes are not distributed evenly but occur in bands or zones which shade off gradually into bone of normal or even diminished density as if the intensity of the disease had varied at different stages of growth Because of the way new bone is laid down these bands appear transverse in the shafts of the long bones and ringlike in the epiphyses vertebral bodies and other round bones

Bone changes due to impaired bone formation are most evident at the ends of the long bones which are cupped and often ill defined identical appearances may be seen in rickets and osteopetrosis In other cases, the epiphyses are recessed into the ends of the long bones as if these had been softened and the epiphyses pressed into them Other manifestations are undertubulation and retarded bone development Despite increased roentgenographic density the bones are probably softer than normal as they often become bowed by the hypotonic muscles

(8) Am. J Roentgenol. 78 19-29 July 1957

Ectopic soft tissue calcifications most commonly noted in the renal parenchyma, may also be seen in blood vessels brain, intermuscular planes bronchi and a variety of other structures Etiology is unknown but the most likely cause is hypersensitivity to vitamin D

Severe Osteomalacia Associated with Occult Steatorrhea Due to Nontropical Sprue Report of Five Cases is presented by John L Juergens Donald A Scholz and Eric E. Wollaeger[9] (Mayo Clinic) One of the commonest causes of osteomalacia in this country is poor absorption of calcium from the gastrointestinal tract secondary to prolonged untreated steatorrhea Nontropical sprue (idiopathic steatorrhea) is a frequent and important cause of steatorrhea and must always be considered when the etiology of osteomalacia is obscure Nontropical sprue may not show the classic picture of frequent copius fatty foul-smelling stools. Sometimes the patient will have normal bowel habits and the secondary manifestation of osteomalacia may completely dominate the clinical picture

The 5 cases reported occurred in women aged 40-71 who sought medical aid for disabling skeletal pain usually involving the back or lower extremities with few or no symptoms referable to the gastrointestinal tract Chest pain was present in 3 In all the serum calcium was below normal and the serum alkaline phosphatase was elevated initially All had x ray evidence of demineralization of bone especially in the spinal column and lower extremities Two patients recalled an episode of prolonged diarrhea 20 or more years before the first clinic visit The others had had only occasional and transient episodes of diarrhea. All but 1 patient had lost 12 30 lb

The patients were put on a diet low in fat high in protein carbohydrate and calories Medication included calcium lactate by mouth 50,000-200 000 units of calciferol daily by mouth 4 mg of synthetic vitamin K by mouth each day or twice a week, depending on the severity of the steatorrhea crude liver extract and a multiple-vitamin capsule daily All patients had marked remission of osteomalacia symptoms The values for calcium phosphorus and alkaline phosphatase in the blood tended to return to normal as long as the

(9) A.M.A. Arch. Int. Med. 98:774-782, December 1956.

patients followed the program outlined for them The pseudofractures healed completely after adequate treatment. However some x ray evidence of bone demineralization persisted in all patients

Osteomalacia from Hyperosteoblastosis and Osteomalacic Forms of Hyperparathyroidism. It is generally admitted that osteomalacia and hyperparathyroidism are two very different diseases However on the basis of a previous case report A Lichtwitz S de Seze D Hioco Ph Bordier and A Mazabraud[1] (Paris) consider in addition to the classic forms of osteomalacia related to a phosphocalcic deficiency, forms due to increase of osteoid tissue As the case also indicates that the same bone can be the site of important destruction of old bone and of edification of new bone with calcium fixation an attempt was made to trace the respective destinies of the exogenous and endogenous calcium

Osteomalacia can be the result of a phosphocalcic deficiency or of excess of osteoid tissue which a normal phosphocalcic intake cannot mineralize. In primary hyperparathyroidism osteoclastic resorption is accompanied by medullary fibrosis and a degree of osteoid proliferation The latter can conceal the osteolytic process and thus produce the osteomalacic form of hyperparathyroidism If this form is rare perhaps it is because the osteomalacic element vanishes as soon as the exogenous calcium intake is sufficient to mineralize the osteoid tissue

The clinical signs balance sheets hypercalciuria test and pathology all indicated that the bone tissue lost great quantities of endogenous and fixed large quantities of exogenous calcium Thus two different circuits were distinguished in regard to calcium metabolism one for endogenous calcium which released from the bone enters the blood and from there the urine and feces and one for the exogenous calcium which goes from the intestines to the bone where its fixation is in relation to the extent of osteoid trabeculae

Osteomalacia with Biochemical Syndrome of Hyperparathyroidism or Primary Hyperparathyroidism with Clinical Syndrome of Osteomalacia. A Lichtwitz S de Sèze D Hioco Ph Bordier and A Mazabraud[2] (Paris) report a case

(1) Presse méd. 65 45-47 Jan. 9, 1957
(2) Ibid. 64 2031 2033 Dec. 5 1956.

that was diagnosed clinically and radiologically as osteomalacia but in which all laboratory findings pointed toward hyperfunction of the parathyroids which was confirmed pathologically Thus in certain cases it is difficult to know whether there is primary osteomalacia complicated by secondary hyperparathyroidism or primary hyperparathyroidism with osteomalacic characteristics

Signs in favor of osteomalacia were radiologically Milkman s syndrome histologically numerous and large osteoid areas biochemically hypocalciuria low Ca×P product and 5% instead of 25% excretion of injected calcium Results also showed secondary hyperparathyroidism calciuria in constant oscillating from 4 4 to 11 4 mg /100 ml calcemia, normal phosphoremia, very low at 1 1 and 2 mg instead of 2 4 and 2.7 mg as in osteomalacia phosphaturia an average of 50 mg /100 ml in 24 hours contrasting with low phosphoremia and showing diminished phosphorus reabsorption by the renal tubule cells

After a calcium perfusion calcemia rose to 14 5 mg /100 ml whereas phosphoremia remained at 2 3 2 4 mg After administration of vitamin D_2 calciuria immediately rose instead of lowering calcemia rose instead of remaining normal phosphoremia rose slightly to 2 9 mg instead of 4-5 mg /100 ml and phosphaturia hardly varied

The Milkman syndrome disappeared after vitamin therapy which was discontinued because of the following values hypercalcemia 12 1 mg /100 ml hypercalciuria 26 mg hypophosphoremia 2 3 mg and phosphaturia relatively elevated at 48 mg Until surgery calcemia was between 12 1 and 14 4 mg calciuria between 27 5 and 40 mg phosphoremia between 1 9 and 2 1 mg and phosphaturia oscillated between 50 and 120 mg in 24 hours At operation 3 parathyroids—2 small ones and 3/5 of the third—were removed They weighed 18 Gm and microscopically were made up of water-clear cells

This discovery of a primary hypertrophy hyperplasia lesion is of great interest as it suggests two hypotheses The authors believe that osteomalacia and hypertrophy hyperplasia of the parathyroid glands are not contrary to general opinion a sign of primary hyperparathyroidism This is merely hyperfunctioning of the parathyroid glands second

ary to an ignored osteopathy The second theory assumes that there are particular varieties of primary hyperparathyroidism which appear on the x ray film as typical osteomalacic lesions

Osteomalacia Following Gastric Surgery I McLean Baird and Samuel Oleesky[3] (Univ of Sheffield) report 5 cases of osteomalacia due to steatorrhea following gastric surgery Surprisingly few such cases are reported in the literature In view of the frequency with which partial gastrectomy is performed even if the incidence of subsequent steatorrhea is low there are doubtless many causes of undiagnosed osteomalacia

Many of these patients carry a label of rheumatism a diagnosis often given to the patient with undiagnosed osteomalacia no matter how the osteomalacia has arisen Any patient complaining of multiple aches and pains after partial gastrectomy or gastroenterostomy should be suspected of having osteomalacia Serum calcium inorganic phosphate and alkaline phosphatase should be estimated x ray examination of the bones should be made and if necessary a bone biopsy should be performed.

The abnormal physiology in these patients is probably related to absorption of vitamin D and calcium due to the steatorrhea It takes at least 2 years to develop osteomalacia after gastrectomy associated with the steatorrhea of obstructive jaundice

Treatment consists of high doses of vitamin D 100 000-200 000 units together with 5-10 Gm calcium lactate daily There is no need to give high doses of vitamin D routinely after gastric surgery such a practice would be dangerous

In 1 patient who had gastroenterostomy during the phase of skeletal growth subsequent treatment produced skeletal changes of healed rickets

Fluoride Osteosclerosis is discussed by Clyde A Stevenson and A Ralph Watson[4] (Temple Tex.) Probably most objections to the addition of fluorides to drinking water took root from Roholm who reported extensive osseous changes in cryolite (Na_3AlF^6—54.3% fluorine) workers who inhaled this dust for many years There also have been a few reports

(3) Gastroenterology 33:284-292, August, 1957
(4) Am. J Roentgenol. 78:13-18 July 1957

of osseous changes developing in rock phosphate (about 4% fluorine) workers who inhaled this dust for a considerable time

The authors found 23 cases of fluoride osteosclerosis among 170 000 x rays of the spine and pelvis of patients living in Texas and Oklahoma where many communities have excessive fluoride content in the drinking water In each instance clinical examination failed to establish any relation between the x ray findings and the clinical diagnosis of the patient s condition

It was found that fluoride osteosclerosis developing in the patient exposed over many years to fluorides as high as 8/ppm causes no harmful changes No x ray evidence of fluoride osteosclerosis was noted in patients who drank water with a fluoride content of less than 4 ppm The fluoride amount advocated for public water supplies for prevention of dental decay is up to 1 ppm In patients with sclerosis of the bone calcification of the sacrospinous and sacrotuberous ligaments is a distinct aid in diagnosis of fluoride osteosclerosis

Benign Osteopetrosis Report of Nine Cases. According to Arnold D Piatt Gerald A Erhard and Jacob S Araj[6] (Newark O) benign osteopetrosis is a bone condition compatible with reasonably normal living and may be asymptomatic or mildly symptomatic More than 200 cases have been described in the literature. Although this condition occurs among all age groups it occurs more often in infants and children The cause is unknown but a hereditary factor has been shown in some cases

Histopathologic changes vary with the stage of the disease The essential pathologic change is sclerosis of bone with increased trabeculation and irregular bony architecture (Fig 189) There is hypercalcification of cartilage with persistence of the calcified cartilage The marrow space is decreased or obliterated in advanced cases Any residual marrow is of myeloid type with evidence of fibrosis rather than lipid deposition The osteoblasts are [illegible]creased in number whereas the osteoclasts are d[illegible] [illegible]bsent. Perivascular lympho[illegible] [illegible]ltration is [illegible] pronounced loss of the fibril[illegible] [illegible]e is noted [illegible] in the cor

(5) Am J Roentge[illegible] [illegible] 1 December

tex. Other observations on autopsy are mainly manifestations of extramedullary hemopoiesis involving the liver, spleen and lymph nodes

Clinical manifestations include multiple fractures that occur with minimal amount of trauma hepatosplenomegaly



Fig. 189—Homogeneous sclerosis and loss of medullary cavity in long bones. There has been no influence on modeling. (Courtesy of Platt, A. D., *et al.* Am. J Roentgenol. 76 1119-1131 December 1956.)

and generalized lymph node involvement hypochromic anemia, deafness and optic nerve atrophy hydrocephalus and pronounced dental caries

On roentgen examination the long bones show homogeneous chalky density with lack of differentiation between the cortex and the medullary cavity Frequently noted are transverse and longitudinal striations at the metaphysial ends of the bones Also at the metaphysial ends clubbing is

observed with loss of modeling The nutrient foramens are narrowed or obliterated. Coxa vara and genu valgum deformities often exist

The bones of the skull when involved show a similar homogeneous pottery type of density with loss of the diploic spaces between the tables of the skull There is no apparent increase however in over all dimensions of the skull. Thickening of the base of the skull is prominent with encroachment on the cranial nerve foramens If involvement of the facial bones occurs the paranasal sinuses are narrowed or partially effaced. The iliac bones of the pelvis show alternating dense and translucent zones parallel to the iliac crests resembling growth rings in a tree At times these curvilinear stipplings are not present but instead the chalky somewhat homogeneous type of sclerosis is present.

Changes occur in the vertebrae which are quite striking in appearance The upper and lower portions of a body show platelike condensations with a translucent zone bisecting the body horizontally A wedge shaped area of diminished density is observed on the anterior aspect of the body in the midthird from which the translucent zone extends posteriorly Occasionally a central core of bone density is noted in the center of the translucent zone that resembles a neonatal vertebral body and is termed an insert. In more advanced cases and in older patients the vertebrae may be involved with uniform chalky sclerosis similar to that observed in the long bones The ribs may show the marbleized process as well as widening The carpal and tarsal bones exhibit rather unusual concentric rings of dense and clear bone

Hypophosphatasia is discussed by Guido Currarino Edward B D Neuhauser Gertrud C Reyersbach and Edna H Sobel[6] (Harvard Med School) This condition is a chronic familial disease of uncertain etiology characterized by deficient bone formation histologic changes resembling rickets and low phosphatase activity of serum, bones and other tissues Other less constant features are defective ossification of the skull in early life with subsequent development of premature craniosynostosis premature loss of deciduous teeth hypercalcemia and urinary and renal function abnor

(6) Am. J Roentgenol. 78:392-419 September 1957

malities The disease may occur in siblings and one or both parents often show a low serum phosphatase without evidence of bone disease.

Generally the disease becomes less severe with increasing age. The disease may start in utero in the newborn or in postnatal life. Among the newborns in the authors series the clinical features were identical Each was born at term with a globular and boneless skull soft skeleton and severe deformities of the extremities They failed to breathe or breathed poorly They died shortly after birth or at age 2-6 months The common symptoms and signs were irritability jerky movements or convulsions failure to gain weight and slow growth in length and in head circumference. Cyanosis anorexia vomiting constipation loud cries and fever were prominent but not constant features

In infants the symptoms appeared gradually between ages 1 and 6 months after a period of apparent good health The clinical picture was characterized by anorexia vomiting constipation failure to thrive or grow recurring episodes of unexplained fever irritability and hypotonia Convulsions cyanosis and episodes of loud cries were noted in some The cranial sutures were separated the anterior fontanel was wide bulging and often tense and the scalp veins were prominent These features progressed rapidly for a few months then improvement was observed in all patients who survived and were followed But 5 died between the 8th and 10th month of life at the disease s peak

In children the usual complaints included delayed onset of walking defective gait knock knees painful extremities marked dental caries and occasionally short stature A rachitic rosary and enlarged bone ends were other prominent features

By x rays the basic skeletal abnormalities common to all patients whether severely or mildly affected consisted of diminished and irregular bone formation in the presence of continuing proliferation of the preosseous tissue. Follow up examinations showed the process slowly subsided in some bones but in others the metaphysial features remained essentially unchanged over many years However bone growth continued in some patients at a normal and in others at a somewhat reduced rate

Fractures in the Aged Carter R Rowe and Robert C Detwiler[7] (Massachusetts Gen'l Hosp) state that fractures are an important cause of disability and death in person over age 70 They are three times as frequent in women as in men and more than a third are fractures of the hip

The coexistence of other causes of disability must be considered in planning surgery but the elderly patient without serious complicating disease is a good operative risk Sedation anesthesia splinting casts fixation and postoperative exercise should be adapted carefully to the given case and sometimes have a profound effect on the attitude and progress of the patient

In cases of compression fractures of the vertebral bodies the authors make no attempt at reduction unless dislocation or facet instability has occurred the compression is accepted and excellent results are obtained by suitable physical therapy The fractured hip is more successfully treated since the introduction of the three-flanged nail for stabilization It is important to use mechanical aids for early ambulation to relieve pain restore weight bearing and avoid stiff joints Continued organized help after the patient is discharged is frequently essential for complete rehabilitation.

Rehabilitation of the Aged Amputee according to Bruce B Grynbaum Edward E Gordon and Seymour S Bluestone[8] should start well in advance of amputation This includes the emotional preparation of the patient for the loss of a member as well as selection of the site for amputation, if surgically possible. The longest stump consistent with good skin coverage and adequate circulation is best. The end result of rehabilitation in the below knee amputation far surpasses that in the above knee amputees

A program of progressive resistive exercises is prescribed for the uninvolved extremities and trunk as well as for the stump These exercises are started as early as permitted by the patient s condition and are adapted to his individual

(7) J.A.M.A 163 1517 1522, Dec. 22, 1956.
(8) Geriatrics 12.592 597 October 1957

medical status Standing and balancing activities are begun in parallel bars at the earliest possible date followed by swing through ambulation Only after the patient has mastered these skills in the parallel bars is he allowed to un



Fig. 190.—Below-knee amputee, aged 80 who walks independently using 2 canes. (Courtesy of Grynbaum, B B., *et al.* Geriatrics 12:592 597 October 1957)

dertake them on crutches This phase is a crucial test which usually determines the feasibility of providing the amputee with a prosthesis Unless he has the strength balance and co-ordination to accomplish these tasks prognosis for ambulation is poor

The optimal goal of ambulation training is a patient who can walk and ascend stairs and curbs without the aid of a cane or crutches In the elderly amputee however we must

often compromise to provide for greater stability and security (Fig 190)

As soon as the wound has healed the patient should begin to wear around the clock a properly fitted and shaped stump shrinker until he begins to use his artificial limb

The prescription of the limb is the responsibility of the physician whose *duty also is to check the fit of the finished* product The stump may continue to shrink for up to 6 months and more or thicker stump socks may be required until it has stabilized and the socket can finally be adjusted

The stump should be washed each night with mild soap and warm water and dried carefully It should be massaged daily with rubbing alcohol both before delivery of the prosthesis and while in use Except when a suction socket is worn the stump should be powdered before the limb is put on

Who should wear a prosthesis? The first consideration in the aged is the cardiorespiratory renal reserve Inasmuch as occlusive vascular disease is apt to be symmetrically distributed circulatory changes in the contralateral extremity often militate against ambulation Degenerative processes affecting learning capacity kinesthetic sense balance and co-ordination are a serious obstacle to functional prosthetic replacement *The elderly bilateral above-knee amputee* who has not previously used an artificial limb will probably never walk again Psychologic reactions to amputation may be a hindrance to successful rehabilitation

Management of Generalized Osteoporosis of the Aged with Compression Fractures of Vertebral Bodies is discussed by Donald S Miller[9] (Chicago Med School) Generalized osteoporosis in the aged is a normal physiologic process found in both men and women but in women it may be noted before age 60 due to the menopause Generalized osteoporosis in itself is not associated with particular symptoms or signs There are relative degrees of osteoporosis and x rays may or may not define these accurately Many *osteoporotic patients have a gradually developing* compression from stress and strain with ultimate dorsal kyphosis Pain may be minimal notwithstanding advancing deformity Associated loss in height and muscle atrophy are commonly

(9) S. Clin. North America 37 177 194 February 1957

observed as multiple wedged vertebrae. Some patients maintain a fairly erect posture and do not evince local changes unless traumatized Neither group has the intense pain immobility or disability found in younger patients with fractures in similar areas

Weight gain is important With improvement in appetite and dietary regimen steroid medication and tolerable mobility muscle atrophy should be reduced and alertness improved Bed rest must be minimized Cumbersome heavy casts and large heavy braces are to be avoided. Temporary immobilization during the acutely painful stage is preferred light weight corseting or light weight duraluminum braces can usually be tolerated for relatively short periods without local irritation and attendant painful neuritic phenomena. This gives sufficient immobilization Mild analgesics may be given for pain.

In osteoporosis there is often gradual fixation of the thoracic lumbar spine. This is because it is frequently associated with chronic osteoarthritis or rheumatoid arthritis either of which prevents major deformity and anatomic changes of fixation

Corticosteroids for associated arthritic disorders though given cautiously are not currently being discontinued while they alleviate greater discomforts notwithstanding their accelerating effect on the osteoporotic process Hormone therapy has given excellent results Combined estrogens and androgens counteract virilization or feminization The patient should be encouraged to continue with usual chores but to be careful in movements With moderate activity graduated exercises home physical therapy and careful home nursing clinical improvement may be predicted The advanced osteoporotic spine may be fractured so easily by an abrupt movement or from the slightest trauma that, in the event of litigation interpretation of x rays to determine the cause for court testimony is difficult.

Current Concepts of Osteoporosis are considered by Paul D Redleaf[1] (Univ of Minnesota) Osteoporosis is a clinical syndrome of bone demineralization probably resulting from a deficiency of the bone matrix. It is often associated with metabolic disturbances characterized by decreased protein

(1) Minnesota Med. 40:165-175 March, 1957

synthesis or increased protein breakdown Further studies might demonstrate enzyme processes involved in bone matrix formation and provide a more rational basis for hormone therapy

Etiologic treatment is rarely possible. Usually the most that can be done is to provide the dietary constituents requisite to bone formation and stimulate use of these raw materials through steroid therapy Supplementary calcium, vitamin D and strontium increase mineral retention and often produce symptomatic improvement. Gonadal steroids also produce calcium retention probably through stimulation of osteogenesis Natural or synthetic estrogens are equally effective in treatment of osteoporosis Any of the following preparations give equivalent results diethylstilbestrol 0 5-1 mg daily by mouth estrone sulfate, 2.5-3.75 mg daily by mouth, estradiol benzoate 1 66-3.32 mg 3 times weekly intramuscularly and estradiol dipropionate 5 mg once weekly intramuscularly Higher doses apparently confer no added benefit The following regimens have been recommended for androgen therapy of osteoporosis methyltestosterone 10-20 mg daily by mouth testosterone propionate, 10-25 mg once weekly intramuscularly and testosterone two 75-mg pellets implanted subcutaneously every 3-4 months

Although the concept of osteoporosis as a deficiency of bone matrix fits the clinical picture and response to hormones which stimulate anabolic processes it is difficult to understand the positive calcium balances produced by dietary measures alone The variability of bone salt composition and the demonstration that the apatite lattice can adsorb or exchange ions from the surrounding medium offer a possible explanation Although factors influencing calcium absorption are not completely understood and individual variations are difficult to explain it seems possible that calcium supplements might increase absorption produce a transient rise in serum calcium levels and thereby promote adsorption of more calcium by bone salt crystals Increases in bone calcium content too slight to be detected histologically or by x rays might nonetheless cause symptomatic improvement Thus better than adequate mineralization might compensate in part for less than adequate matrix. Such a

concept could also account for the beneficial effects of strontium therapy

By analogy with other hormones it is plausible that gonad steroids affect the skeleton through acceleration or inhibition of enzymatically controlled reactions Changes in enzyme concentration occurring in tissues and organs under the influence of hormones can be correlated with changes in their function and with the level of the hormone acting on the end organs This is well illustrated by the changes in the alkaline phosphatase, acid phosphatase adenosine tri phosphatase succinic dehydrogenase malic dehydrogenase and total glycolysis of the corpus luteum of the rat during pregnancy and lactation

Current Concepts in Management of Osteoporosis are evaluated by Donald V Adams[2] (Portland Ore) Treatment of osteoporosis will depend on its cause and should aim at alleviation of pain prevention of further deformity and restoration of bone structure Treatment will involve diet drugs and orthopedic management In older patients a high protein diet should be maintained During hormone therapy a little calcium and vitamin D may be indicated in the diet to accelerate bone reossification However excessively high intake of calcium phosphorus and vitamin D should be avoided because hypercalcemia could result in renal calculi

Estrogens seem to have a greater effect on calcium balance than androgens However androgens exert a greater effect on protein metabolism than estrogens Rechtman and Yarrow give 1.25 mg conjugated estrogens with 10 mg testosterone propionate intramuscularly every day for 10 days then reduce the dosage by half for maintenance This treatment probably is preferable to plain estrogen therapy because of the protein stimulating action of testosterone In view of the possibility of cancer with continued estrogen therapy it is wise to interrupt medication for 7 10 days every 4-6 weeks even when the uterus has been removed. An occasional vaginal smear is another safeguard When pelvic organs are intact, a record of vaginal bleeding should be kept Any bleeding not according to schedule (not after estrogen withdrawal) should be investigated promptly

(2) Northwest Med. 56:291 297 March, 1957

Albright suggests that women should not be given more than 200 mg testosterone/month to prevent hirsutism and masculinization The hormone may cause sodium retention, resulting in edema especially in elderly persons with low serum protein levels This may be controlled by low sodium diets or by ammonium chloride diuretic therapy With this course of therapy calcium and phosphorus excretion is down within a week Subjective improvement may not become manifest for several weeks, though often it is dramatic Clinical improvement is quite out of proportion to that noted by x ray study

The patient should sleep on a hard bed Usually a brace is unnecessary Immobilization and undue bed rest should be avoided In bedridden patients local exercise helps the general condition Heat and massage relieve pain and muscle spasm

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MISCELLANEOUS

Microbial Complications of Antibiotic Therapy may be grouped according to John E Blair[3] as (1) those resulting from sensitization of the patient to the therapeutic agent, evidenced by rashes, dermatitis stomatitis edema or the severe manifestations of serum sickness and anaphylactoid reactions (2) those caused by the direct toxic or irritating action of the drug on body tissues as shown by damage to the tissues of the kidneys and urinary tract gastrointestinal tract, liver blood forming organs or nervous system and (3) those resulting from the emergence of drug resistant micro-organisms

That some form of complication may occur during antibiotic therapy is a calculated risk far outweighed by the probable benefits of treatment Actually the incidence of complications is comparatively low in proportion to the many persons receiving antibiotics at any given time The rate of emergence of resistance varies with the drug and with the bacterial species and the occurrence of resistance in some species is rare At present it does not appear possible completely to prevent the appearance of resistant strains of

(3) Bull. Hosp. Joint Dis. 17:284-296, October 1956.

such organisms as the tubercle bacillus or staphylococcus it is possible however to attempt to reduce the chance that they will develop Theoretically it should be possible to maintain a drug concentration in the body sufficiently high to eliminate sensitive organisms and to hold in check the first steps of mutation to resistance This has obvious practical limitations and is of no value when the infection is due to an already resistant organism

The combined use of two antibiotics is a more reasonable approach provided the agents selected differ in their mode of action are not equally distributed in the body and show no cross-resistance It is likely that mutation to resistance to two different antibiotics does not occur at equal rates and combined therapy should reduce the chances of emergence of resistance to either drug used However combined therapy is not required in every infection In most a single antibiotic is usually fully effective and should be used whenever indicated In planning treatment selection of the proper antibiotic is aided by determination of the sensitivity of the offending micro-organisms

Penicillin in adequate dosage still is effective in the treatment of some acute staphylococcic infections due to penicillin sensitive strains The chance of mutation of a penicillin sensitive staphylococcus to resistance during adequate therapy appears slight When antibiotics other than penicillin are used especially the broad spectrum antibiotics the likelihood of mutation to resistance is greater Superimposed and primary infections due to antibiotic resistant strains present a different, more difficult problem

Long term Results of Orthopedic Surgery in Cerebral Palsy were evaluated by Winthrop M Phelps[4] (Baltimore) in 242 patients on whom nearly 500 operations had been performed Most patients were seen 10-15 years and none less than 5 years after operation

The author concludes that orthopedic surgery has a definite place in the treatment of cerebral palsy However not all the surgical procedures successful in poliomyelitis are adaptable to cerebral palsy since the two conditions are entirely different

The effects of growth and consequent recurrence of de-

(4) J Bone & Joint Surg. 39 A 33-39 January 1957

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(3) Bull. Hosp Joint Dis 17:284 296 October 1956.

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The effects of growth and consequent recurrence of de-

(4) J Bone & Joint Surg. 39-A 53-59 January 1957

formities must be considered in evaluating functional results Tendon lengthenings and tenotomies are more successful after growth is ended They are seldom successful when performed during the period of growth unless the desired tendon length can be maintained by a brace.

The status of the antagonists of all muscles for which surgery is contemplated must be carefully determined. Muscle transplantation in spastic and athetoid patients always fails because the injury in cerebral palsy does not involve single muscles as in poliomyelitis or other lower motor neuron lesions but affects total joint function or position which is mediated through the upper motor neurons. In spasticity there is stimulation and in athetosis release of the upper motor neurons Thus good long term results cannot be obtained from muscle transplantation in either condition. The presence of athetoid shift must be recognized. Sometimes external fixation with a brace or cast can be used to determine whether a favorable or unfavorable shift would result from surgery

Bone surgery statistically has proved highly successful and should be the basis for further development in the field of cerebral palsy Among tendon procedures hamstring and adductor tenotomies produce a relatively more successful result

Ultrasonics in Medicine On the basis of results in 611 patients given a total of 6 675 ultrasonic treatments from November 1951 to January 1956 Ferdinand F Schwartz[5] (Med College of Alabama) considers this form of therapy a helpful adjunct in the treatment of certain neuro- and skeletomuscular diseases Dosage never exceeded 1 5 watts/sq cm and the time was 5 10 minutes The appropriate dose was selected on the basis of tissue involvement and experience Treatment was discontinued if no improvement was noted after 15 treatments Only three complications occurred a dizzy spell a fainting spell and weakness

Of the 611 patients 498 had lessening of pain and spasm Most failures in the others were due to long standing chronicity and lack of co-operation of the patients Improvement was obtained in 76% of 25 patients with rheumatoid

(5) J M A Alabama 26 200-204 February 1957

arthritis However the patients were also given medications such as cortisone and ACTH with the ultrasonic therapy but the course of the disease was greatly shortened by relief from muscle spasm pain and stiffness Best results were obtained in patients with knee and hand involvement

The most dramatic results were obtained in patients with subdeltoid bursitis whose x rays revealed calcareous deposits Some after the first sounding had immediate relief from pain The earlier the patients were treated the better the results If the calcium deposit had undergone definite bonelike changes then the deposit was not destroyed by ultrasonic therapy Patients who had a hand shoulder syndrome with the bursitis had no clinical benefit.

► [As with many new methods of therapy it was difficult in the early stages of ultrasonic therapy to prevent damage to normal tissues while undertaking to treat those which were diseased or otherwise abnormal. In the rather narrow range of the therapeutic dosage, ultrasound has proved to be helpful in many orthopedic conditions. In some instances, ultrasonic therapy has been more effective than short wave diathermy The warning that ultrasonic therapy should be used only by the highly trained technician under careful supervision cannot be overemphasized. It will do vastly more harm than good if placed under the control of untrained heads and hands.—Ed.]

Treatment of Crushing Injuries to Chest (Methods Old and New) Edward E Avery Jerome R. Head. Theodore R. Hudson and Richard J Bennett[6] (Northwestern Univ) point out that management of a seriously crushed chest involves prompt establishment of an adequate airway treatment of shock and decompression of hemopneumothoraxes Intubation with an endotracheal rubber tube or bronchoscope is necessary To prevent atelectasis and pneumonitis frequent aspirations of the trachea must be done The extent of possible hemo- and/or pneumothorax should be evaluated by an x ray film of the chest with the patient upright. Continuous intrapleural drainage should be maintained by insertion of large bore thick walled rubber tubes connected to a water seal drainage bottle. Two drainage tubes are usually used One should be placed in the middle or posterior axillary line of the 7th intercostal space, to lie in the posterior gutter so as to drain fluid accumulations in this region. A second tube is put in the midclavicular line at the inframammary level to allow drainage of accumulations of

(6) Am. J Surg 93 540-549 April, 1957

air anteriorly Paravertebral block can be carried out to relieve painful splitting of the respiratory muscles due to fractures of the ribs

Uncontrolled bleeding after restoration of blood volume

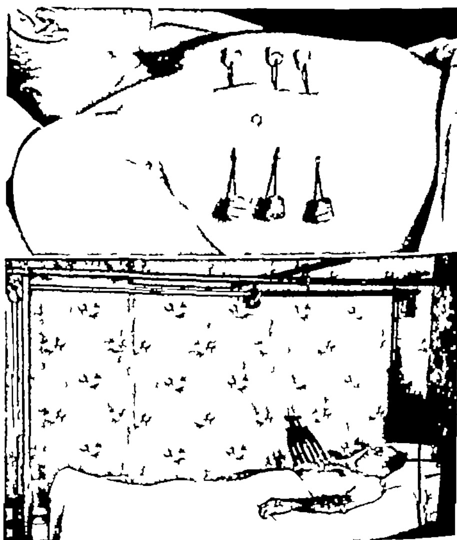


Fig 191 (top) —Patient prepared for soft tissue traction of Hudson.
Fig. 192 (bottom) —Traction with spreader bows attached.
(Courtesy of Avery, E. E. et al. Am J Surg 93:540-549 April, 1957; from Hudson, T R., et al J A.M.A. 156, 768 1954)

requires emergency thoracotomy and control of bleeding points Continuous bleeding after chest injury usually is due to laceration of the intercostal or internal mammary arteries Uncontrollable air leaks from the drainage tubes in the chest and progressive mediastinal emphysema often

suggest a ruptured bronchus or trachea This along with chylothorax, cardiac tamponade and rupture of the esophagus or diaphragm often demands surgery Softening of the bony thorax due to multiple rib fractures allows paradoxical motion of the chest wall with pendulation of air between the lungs This can be relieved by mechanical respirator Minor or moderate degrees of chest wall instability due to fractures of the ribs or sternum or costochondral separations usually can be controlled by the soft tissue traction method of Hudson Long metal pins are passed under the pectoralis and serratus anterior muscles on either side of the chest (Fig 191) Spreader bows are attached and traction is applied to an overhead frame (Fig 192)

It is concluded that minor to moderate degrees of paradoxical motion of the chest wall can be controlled by external traction or internal fixation of the ribs provided the patient can carry on adequate voluntary respiratory efforts to maintain proper ventilation However prolonged mechanical hyperventilation therapy is necessary for the more serious injuries to the chest when extensive damage to the lungs muscles nerves and brain prevent the patient from maintaining active respiratory efforts with adequate ventilation

Clay Shoveler s Disease in Adolescents (Schmitt's Disease) Report of Two Cases. In 1941 Schmitt reported a case in which x ray signs in the spinous process of the 1st dorsal vertebra were considered to represent an inflammatory lesion or damage due to overexertion In 1951 Schmitt and Wisser reported 3 other cases All patients were boys aged 14-16 and all gave a history of heavy work or exertion before onset of signs and symptoms Slight edema was noted over the spinous process and there was local tenderness to pressure. The main x ray changes were proximal to the apophysis which was irregularly shaped and displaced in a caudal direction After healing the spinous process showed normal bone structure but had an abnormal shape. W J Weston[7] reports 2 similar cases

CASE 1 —Boy 15 gave history of rolling head-over heels down a bank 5 months ago He complained of tenderness in the upper dorsal spine and pain on vigorous movements of the shoulders for 1 month. There was local tenderness over the spines of the last cervical and

(7) Brit. J Radiol. 10:178-180 July 1937

upper 4 dorsal vertebrae. Spine x rays showed areas of sclerosis and osteoporosis in the tip of the spine of the 7th cervical vertebra, which were considered to represent a type of aseptic necrosis. The patient was advised to avoid sports and all heavy work. On examination 3 months later symptoms were diminishing in intensity An x ray showed considerable repair taking place in the spinous process. Symptoms disappeared during the next 2 months and x rays showed almost complete healing An x ray taken 20 months after the initial injury showed complete repair

CASE 2.—Boy 14 the day after an athletic meeting noted severe pain in the upper thoracic region on moving the shoulders and on stretching Rest relieved the pain X rays made 2 weeks later showed areas of osteoporosis in the spinous process of the 1st dorsal vertebra just proximal to the apophysis (Fig 193 *A*) Three weeks later an

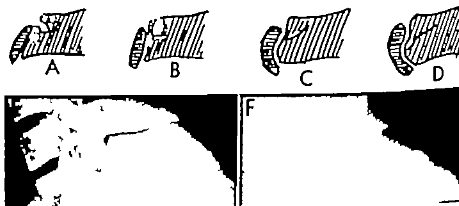


Fig 193 —Various stages of disease process in boy 14 *A D*, osteoporosis in spine of 1st dorsal vertebra 5 weeks fter onset, *E*, residual deformity of spine and apophysis of 1st dorsal vertebra about 2 years after onset *F* (Courtesy of Weston, W J : Brit. J Radiol. 30.378-380 July 1957)

x ray showed further osteoporosis (*B* and *E*) The white cell count was 7,500 The Mantoux test was negative. One month later the patient still complained of pain in the upper back. Flexion of the head caused pain, and tenderness was elicited on palpation of the 1st thoracic spinous process. A spinal brace and headpiece were fitted. The pain subsided immediately Three months later there was no tenderness on palpation of the spinous process of the 1st thoracic vertebra nor pain on flexion of the neck. The splint was discarded. Two years after onset, the patient had no pain and was engaged in heavy physical exercise. X rays showed the apophysis to be ununited, deformed and displaced caudally (*D* and *F*)

The disease process has been considered by Schmitt and Wisser to be a juvenile type of clay shoveler s disease. They consider the spinous process especially vulnerable to strains that may occur at this age just before or after the apophysis has appeared They wonder whether there is a latent acquired defect that becomes manifest by overloading

Hypercholesteremic Xanthomas of Tendons one manifestation of hypercholesteremic xanthomatosis a familial metabolic disturbance were observed by Herman C March, Philip D Gilbert and Thomas M Kain[8] (Philadelphia) in 3 patients The tumors are found on extensor surfaces especially the hands feet and Achilles tendons In association with these soft tissue masses punched-out osseous defects

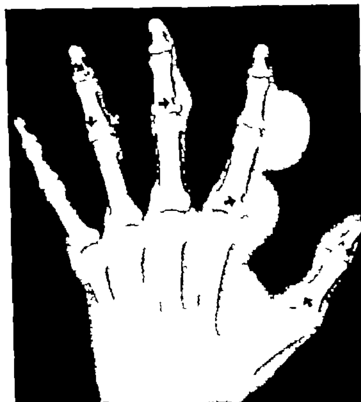


Fig 194—X-ray appearance of hand. (Courtesy of March, H. C., *et al.* Am. J Roentgenol 77 109-114 January 1957)

may occur presenting a goutlike or neuro- fibromatosis like picture The tendency for the articular margins of the joints to be spared and involvement of the Achilles tendons bilaterally should help distinguish the condition from gout roentgenologically

Case 1—Man, 34 presented large, soft, pedunculated, yellowish masses on the elbows buttocks, extensor tendons of the fingers and along the Achilles tendons. Three removed lesions showed benign xanthomas containing cholesterol crystals. Serum cholesterol averaged 500 mg/100 cc. A maternal aunt had the same condition, a

(8) Am. J Roentgenol. 77 109-114 January 1957

sister has xanthelasma and a maternal aunt who died of a coronary occlusion also had xanthomas Figure 194 shows soft-tissue tendon masses in the hands and associated well-defined, punched-out bone defects with slight marginal cortication Similar bone defects were noted in the feet The Achilles tendons ankles and hands (Fig 195) also were involved.

CASE 2.—Woman, 67 had swellings at the back of the ankles and lower legs for 30 years The swellings were at first painful but soon became relatively painless. Over many years, nodules appeared on the extensor tendons of the hands. X rays revealed xanthomatous involvement of the Achilles tendons and tendon xanthoma near the left elbow Blood cholesterol level was 490 mg /100 cc. The patient has a son with extensive xanthomas of the hands Two daughters

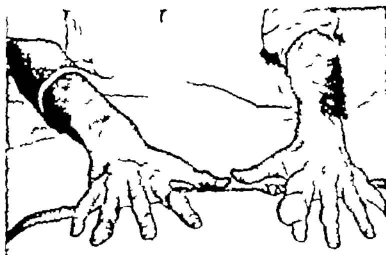


Fig 195 —Soft tissue masses on hands. (Courtesy of March, H. C., et al Am J Roentgenol 77 109-114 January 1957)

show hypercholesteremia and 1 has xanthelasma palpebrarum and a small tendon xanthoma on the hand. The daughter of the latter is the patient in Case 3

CASE 3 —Girl 16 had noted some lumps for about a year on the hands and backs of the ankles. The latter were somewhat painful at onset. The rather small nodules on the hands were in the extensor tendons. X rays showed no bone lesions The Achilles tendons showed early xanthomatous involvement. Blood cholesterol level was 500 mg /100 cc.

Doctor and Automobile Accident. Murray E Gibbens, William V Smith and Ward B Studt[9] (VA Hosp., Denver) suggest certain well tested automobile improvements that would lower the mortality and injury rates could be

(9) J.A.M.A. 163:253-259 Jan. 26 1957

incorporated into the modern car easily and inexpensively. Better roll-over frames are necessary, and safety seat belts should be standard equipment. Safety door latches, padding of the dashboard, elimination of projecting items inside and outside, shock absorbing steering wheels, a mechanism for restraining all folding seats, provision for holding luggage securely and certain improvements in lights, mirrors and signal systems would often save lives.

Other safety equipment which should be standard includes reflective tape on the rear bumper, inside margins of all doors and perhaps on the sides of cars, a left door outside mirror preferably placed where it can be reached and adjusted by the driver, back up lights and a better central stop light as well as the regular stop lights, especially on station wagons in which passengers in back seats are much more vulnerable to crashes from the rear; electric signal lights for safely signaling at night (in the daytime hand signals should be used to supplement electric signals for maximum safety); front window washers in good working order; good tires and safety rims; a photoelectric eye light dimmer; and a higher windshield and roof on some models for the tall driver. A physician treating accident victims has an opportunity to encourage their relatives and friends to work for the adoption of automobile safety features.

Orthopedic Aspects of Automobile Crash Injuries and Deaths. Jacob Kulowski (St. Joseph, Mo.) states that the nature of automobile crash injuries and deaths is such that the frontiers of medicine are being constantly widened to take into account the factors that cause greater than-chance incidence of accident injuries and ultimate complications in rehabilitation.

There is a need for adequate standards of driver licensure through medical screening and for maintenance of driver fitness. Physicians ought to be in the vanguard of an enlightened motoring population in the vigorous pursuit of the ultimate in crash proofing through the application of valid medical and engineering data. First aid and emergency care should be raised to the high levels already achieved in the definitive diagnosis and treatment of the more serious

(1) J.A.M.A. 163:230-233, Jan. 26, 1957

injuries The socioeconomic medicolegal aspect of rehabilitation of crash victims needs to be explored and developed as it relates to medicine

Roentgenologic Aspects of Motor Vehicle Accidents are considered by Jacob Kulowski[2] (St Joseph Mo) Radiologists contribute to accident prevention by accurate diagnosis of physical defects that may make drivers prone to accidents e g a single situation like cervical arthritis, may initiate a chain of events all along the line in motor transport Besides increasing the chances for accidents the affected person is more vulnerable to whiplashing forces. In these persons the clinical features of such injuries are intensified reflecting in resistance to treatment and tendency toward chronicity Arthritis and other accessory physical aberrations further complicate the medicolegal considerations because the issue of aggravating conditions existing before the accident is always raised

Radiologists can improve first aid by urging against poor handling of simple fractures which sometimes results in compounding This applies especially to intramural handling of fracture cases to and from the radiologic department. Radiologists should insist on professional accompaniment of fracture patients whose handling in the radiologic department might cause further injury without the presence of an intern, resident or attending physician

Secondary shock accounts for most deaths occurring in accident patients who live through the first few hours after injury In anticipation of secondary shock, adequate screening of the head chest and abdomen by roentgenograms should be done in all severely injured patients This calls for some changes in policy with respect to patients who are usually considered to be too ill for extended diagnostic procedures Kulowski feels that once primary shock is being treated there is no point in further procrastination in regard to diagnostic procedures on which life may depend The risk must be taken as in anesthesia and surgery and is minimized by rapid and deft handling early after hospitalization

The critical factors in fatal cases are internal injuries and it is becoming increasingly evident that those of the

(2) Am J Roentgenol 77 115 130 January 1957

chest are superseding those of the head Among 30 fatalities studied at autopsy, there were injuries to the pericardium, heart and great vessels in 10 Such injuries are seldom diagnosed in life or even suspected because too much reliance is placed on portable roentgenologic instead of regular fluoroscopic technics which will demonstrate a malfunctioning heart Radiologists should indoctrinate medical staffs with the difficulty of diagnosis in mediastinal injuries on scout films alone

Appraisal of Problem of Fat Embolism is presented by Leonard F Peltier[3] (Univ of Minnesota) In patients with injuries especially fractures of the long bones the possibility of fat embolism must be considered In addition to the patients in whom clinical signs and symptoms of fat embolism can be detected there are many in whom after injury subclinical fat embolism occurs Using a water soluble fluorochrome and fluorescence microscopy the author was able to detect fat globules in the circulating blood of patients and experimental animals after fractures and operations on bone These droplets were 7-14 μ in diameter and resembled those observed after intravenous injection of olive oil into animals and in patients with fractures of the long bones The author demonstrated fat globules in the circulating blood in 62 of 100 patients undergoing elective orthopedic surgery and in all dogs with fractures of the long bones

There is no clinical correlation between chronic diseases known to be accompanied by lipemia and the incidence of fat embolism occurring after fractures in such patients nor has the incidence of fat embolism following fractures in the absorptive state after a fatty meal ever been shown to be increased In rabbits rendered lipemic by diet the author observed that lipemia did not potentiate the degree of fat embolism accompanying fractures of the femur Thus the systemic fat store readily available in the plasma did not participate in the reaction to injury by coalescing to form fat emboli

Bone because of its high fat content its vascularity and the rigidity of its structure is ideal for the intravasation of fat droplets after trauma When the fracture hematoma is

(3) Surg., Gynec. & Obst. 104 313-324 April, 195

drained and decompressed so that a rise in local tissue pressure cannot occur the amount of fat intravasated into the vessels is reduced This accounts for the decreased incidence of fat embolism in open fractures Once they have intravasated into the vascular bed the emboli pass directly through the great veins to the right atrium arriving there almost immediately A tourniquet effectively sequesters fat in the injured extremity It should be used whenever possible during operations on the bone because it has a positive prophylactic value in diminishing the degree of subsequent fat embolism

In patients dying of fat embolism shortly after injury death is due to acute failure of the right ventricle as a result of mechanical blockage of the pulmonary vessels by the emboli The coincidence of shock under such circumstances potentiates the effect of the mechanical blockage by further impairing the action of the heart.

The latent period between bone injury and the classic clinical signs and symptoms of fat embolism represents the time lag between the lodging of emboli of neutral fat in the pulmonary vessels and the hydrolysis of sufficient fatty acids from this neutral fat to produce the local hemorrhagic effects These effects are due to the action of the free fatty acids on the endothelium The role of embolic fat in cases of fat embolism with the classic clinical signs and symptoms is a chemical one associated with hydrolysis of neutral fat and release of free fatty acids

Exercise Therapy for the Ill is discussed by C H McCloy[4] (State Univ of Iowa) Recently two movements have cooperated to avoid the complications of prolonged bed rest. One is termed early ambulation in which the patient is allowed out of bed 2 3 days after operation and soon after fever (or sedimentation rate) has returned to normal and is encouraged to walk a bit every day In the other form of exercise therapy the patient is first exercised in and later out of bed. With this latter program the patient is usually ready to return to work in about two thirds of the time that it would take without this exercise program Deconditioning is prevented and the period required to recover strength

(4) Journal Lancet 77 93 96 March, 1957

after discharge from the hospital is lessened The exercise must always be prescribed by a physician

The patient must be exercised to the point at which the load on the muscle is in excess of that which has been customary Progress is not made without some overload The progression of exercise must be gradual but continuous The purpose of the exercise is to build up the patient s strength and muscular endurance

The surgical patient is practically normal except for the part that has been operated on For example a person whose gallbladder has been removed may begin exercising the day after surgery if only the parts that are still normal are exercised In the medical patient exercise can be begun as soon as the sedimentation rate is about normal Often exercise can be done with groups of patients and need not always be prescribed singly This has good psychotherapeutic results The patient works better working with others This does not mean the exercise program is the same for everyone. Some patients may be told to stop on the sixth repetition others on the eighth whereas some are told they may not perform certain exercises

Etiology of Peripheral Circulatory Disturbances in Lower Extremities is discussed by Fr Rutscheidt[5] (Univ of Cologne) It is known that the dorsal and ventral roots of the spinal cord contain vasodilating and vasoconstricting fibers which run to the sympathetic trunk The relation between these vascular nerve fibers and the spinal column seems to be very close Anatomic changes in the latter may affect the former and indirectly the vessels supplied by the nerve fibers These considerations seem to be substantiated by the following observations

Of 200 patients with talipes cavus 85% had x ray abnormalities in the lumbosacral area and 60% of 70 patients operated on for spina bifida had spinal adhesions the severance of which lead to clinical improvement in 50% These observations also suggest the effect of spinal column changes on vegetative function.

X rays of the lumbar spine were studied in 19 patien aged 40-68 with intermittent claudication. The ratio of m

(5) Arch. orthop. u. Unfall-Chir 48 648-655 1957

to women was 9 5 1 In 5 patients the lumbar spine showed scoliosis (Fig 196) All 5 had peripheral circulatory disturbances in the leg of that side in which the intervertebral foramens were narrowed due to concavity of the scoliotic spine In 3 patients intermittent claudication was preceded by ischialgia on the same side In 5 with bilateral claudica



Fig 196 (Courtesy of Rutscheldt, F Arch. orthop. u. Unfall-Chir 48 648 655, 1957)

tion the lumbar spine showed more or less severe spondylotic and osteochondrotic changes and 4 more patients had positional changes of the sacrum and early disk degeneration

In 2 patients in the upright position when spinal x rays were taken claudication could be elicited by placing a sand bag of about 12 5 kg on the shoulders X rays revealed that the shoulder load caused narrowing of about 3-4 mm. of the space between the 5th lumbar and 1st sacral vertebra. It is assumed that this narrowing caused irritation of sympathetic fibers which led to narrowing of the leg vessels

Psychologic Problems in Surgery of Trauma J Vernon Luck[6] (Orthopaedic Hosp Los Angeles) states that it is the obligation of physicians involved in the surgery of trauma to acquire the ability to identify and in some degree evaluate and treat clinically significant psychologic factors Psychogenic problems may occur after accidents in patients with no organic injuries may be secondary to organic lesions or may perpetuate symptoms similar to those of a healed organic lesion

An abbreviated neuropsychiatric history is of value when there is indication that a psychologic factor is important in the clinical picture Inquiry should extend into the reactions to family school occupation friends etc. Details about previous disorders which may have been psychogenic and attitude toward job and social customs are important and evaluation of general intelligence must be obtained

Presence of one or more of the following findings is a basis for suspecting a clinically significant psychologic factor (1) striking discrepancy between subjective symptoms and objective findings (2) objective findings of circumferential hypalgesia bizarre radiating pain patterns postures and gaits or timing of pain such as constant pain day and night unchanged by rest and activity (3) too much or too little concern about the injuries (4) unusual degree of mental depression or discouragement (5) confused and indefinite history and repeated introduction of impertinent material (6) failure to respond to organic treatment, including failure to obtain relief from pain even after heavy sedation The more of these findings present the more likely that a psychologic factor exists

Most accidents are related to a personality disturbance Many industrial accidents are created by hostility of the workman and much disability is perpetuated after injury by factors that accentuate this hostility Industries have not participated adequately in rehabilitation of the injured. The practice of not accepting the workman back until he can do a complete hard day's work has led to much emotional turmoil and perpetuation of disability

Accurate and vigorous reassurance about presence or absence of an organic lesion is important in resolving many

(6) Am. J Surg. 93 498-502, April, 1957

anxieties capable of producing disabling psychogenic symptoms Psychologic disorders uselessly dissipate energy Often so much energy is wasted that there is little left to carry on productive work This often produces more tension more anxiety and more dissipation of energy Often the tension state created by the psychologic problem creates true organic pain in the muscles that are kept in a protracted state of contraction, and therapy must be directed toward relaxation of this contraction

During the evaluation period after injuries bad psychologic trends must be watched for Keeping occupied with interesting and useful pursuits helps to prevent morbid preoccupation Since chronic fatigue precipitates much tension, an important part of minor psychotherapy consists of assistance in resolving fatigue state

Bone Changes in Sickle Cell Anemia According to John S R Golding[7] (Univ College of the West Indies) about 80% of patients with sickle cell anemia will complain of pain in and around the bones or joints The basic pathologic changes are the same as elsewhere in the body those secondary to hyperplasia of the bone marrow those due to changes in the blood supply disorders of growth and finally the changes that accompany secondary infection.

The erythroid hyperplasia affects the bone trabeculae and causes absorption osteoporosis softening and change in shape This is well illustrated in the vertebrae which show these changes in about 70% of cases The body of the vertebrae particularly in the lower lumbar region becomes reduced in height and the disks bulge into the bodies causing them to become cupped The change of thrombosis and infarction may also be noted in the vertebral bodies, leading to sclerosis This change is probably pathognomonic for sickle cell anemia In the early stages of medullary hyperplasia the vertebrae present the radiographic appearance of a hemangioma. Later as infarcts organize and become calcified, irregular sclerosis appears

Obvious hyperplastic changes in the skull may be noted on the radiograph in about 25% of cases but in a further 25% mild changes are observed The commonest radiographic change usually is loss of trabecular definition giv-

(7) Ann. Roy Coll. Surgeons England 19:296-315 November 1956.

ing a ground glass appearance to the skull The outer table appears thin and partly absorbed The classic hair-on-end appearance is in fact not common in sickle cell anemia.

Thrombosis and infarction causes severe crippling disability The hip is commonly affected by these processes In 14 cases of avascular necrosis of the head of the femur patients in the younger age group showed changes resembling those of Perthes disease However sickle cell anemia differs from Perthes disease in that in the latter there usually are well marked changes of widening and a cystic appearance in the metaphysial region



Fig. 197 —Pelvis in man, aged 57 showing typical avascular changes in heads of both femora. (Courtesy of Golding, J S. R. Ann. Roy Coll. Surgeons England 19 296-315 November 1956.)

In the earlier onset cases the whole head of the femur may collapse, whereas in the older age group the collapse involves the inner three quarters of the femoral head so that a projecting portion is above the superior lip of the acetabulum and forms a bar to abduction This condition was bilateral in 4 patients so that it was noted in 8 hips (Fig 197) Most of the patients in whom the head of the femur had borne the brunt of the disease showed widened trabeculation and sometimes patchy sclerosis in the pelvis All showed changes somewhere else in the skeleton

Although avascular necrosis causing death of a complete bone was not noted in this series it has been described in the wrist and tarsal navicular, as well as in the lumbar spine Death of a whole segment of shaft was noted in a child aged 15 months

Chronic anemia itself will cause retardation of growth. In sickle cell anemia many of the changes described add to this retardation Vertebral cupping and height diminution results in some degree of kypholordosis and if the head of the femur is affected this may interfere with growth of the femoral neck When a bone is affected in a crisis the part becomes hot and swollen There are fever and moderate leukocytosis This often occurs in the hands or feet of small children Usually these bones show osteoporosis and widened trabeculae and the structure in general has a ground-glass appearance However if the infarct occurs a layer of subperiosteal new bone is laid down which makes it look rectangular Within the bone the cortex loses its structure temporarily and small areas of transradiancy may be seen. When the process is complete the affected bone may be seen to have lost its normal waist and remains with parallel sides. If a joint is affected a large acutely tender effusion develops that is deep yellow and of glairy consistency There are a few red blood cells in the effusion and some of these will have sickled

Osteomyelitis is several hundred times more common in the sickle cell anemia patient than in the rest of the community Two cases of secondary osteomyelitis due to salmonella infection (a rare bone infection) were observed.

Early recognition of sickle cell anemia and treatment with ameliorative measures such as transfusion splenectomy antibiotics surgery rest and avoidance of weight bearing, may save these patients from much increasing and permanent disability

► [With the large migration of Negroes from the South to all parts of the United States, every physician should become interested in and familiar with the symptoms and clinical findings of sickle cell anemia. Because of the characteristic bone changes, orthopedic surgeons may in many instances have the first opportunity for making correct diagnosis.—Ed.]

Sickle Cell Anemia (Homozygous S) with Aseptic Necrosis of Femoral Head Since the advent of the newer technics for differentiating hemoglobin types no case of sickle cell

anemia (homozygous S) proved by these methods has been described in which aseptic necrosis of the femoral head was present Aseptic necrosis of the femoral capital epiphysis has been reported often in the genetic variants of sickle cell anemia

Since the introduction of electrophoresis Kouichi R. Tanaka George O Clifford and Arnold R. Axelrod[8] (Wayne Univ) studied 51 patients with sickle cell anemia (homozy-



Fig 198.—Aseptic necrosis Advanced, right femoral head early left femoral head. Marked flattening, sclerosis, fragmentation and irregular demineralization of right femoral head. Slight increase in density with area of rarefaction, left femoral head. (Courtesy of Tanaka, K. R., et al Blood 11:998-1008 November 1956)

gous S) Of these 6 (12%) had aseptic necrosis of the femoral head (Fig 198) Only 38 were studied by adequate detailed x-rays so the incidence of aseptic necrosis may be greater than 12% Two had no symptoms referable to the joints involved Aseptic necrosis of the humeral head was found in 1

Aseptic necrosis due to caisson disease and trauma can be dismissed because of negative history In a Negro boy age 13 the possibility of coincidental Legg Calve-Perthes syndrome cannot be excluded but bilateral involvement and the patient s race make this unlikely Clinical and ologic progression was observed in 5 patients

(8) Blood 11:998-1008, November 1956.

It might be implied from the data presented by Smith and Conley that the presence of aseptic necrosis in a patient whose red blood cells can be made to sickle indicates a genetic variant of sickle cell anemia rather than sickle cell anemia (homozygous S) The present material demonstrates however that aseptic necrosis may also be found in sickle cell anemia and that this lesion cannot be used to discriminate between sickle cell anemia and its genetic variants

Aseptic Necrosis of Femoral Head Due to Sickle Cell Thalassemia Disease Case Report is presented by C. S Papastavros[9]

Man 38, was hospitalized because of right hip pain for 1 year Results of physical examination were not remarkable except for some limitation of abduction of the humerus bilaterally loss of motion of right thigh and tenderness to palpation over right hip area. The red blood cell count was 4,900 000 and the hemoglobin content 13.1 Gm There were 14 nucleated red blood cells/100 white cells. Biopsy of right femoral neck revealed granulation tissue with no bony pathology After 6 months the red cell count was 4 600 000 with 13 6 Gm. hemoglobin and 11 nucleated red cells/100 white cells. The white cell count was 15 500 The stained smear showed 1 metamyelocyte many target cells 2+ stippling 3+ achromia and strongly positive sickling with sodium bisulfate The electrophoretic pattern showed a prominent amount of sickle hemoglobin and a small amount of normal hemoglobin A, representing about 10 or 15% of the total. Fetal hemoglobin determination was about 5.5%

X ray findings 8 months before hospitalization showed an osteoblastic reaction in the head of the right femur Later films showed the osteoblastic activity with areas of decreased density interspersed between these thickened areas. Films taken 1 year after the initial studies showed evidence of loss of the normal rotundity and smoothness of the right femoral head, indicating a necrotic type of involvement, which was thought to be aseptic necrosis with evidence of a depressed sequestrum and sclerotic adjacent bone. Re-examination 16 months later showed further destruction of the head of the right femur with fragmentation and flattening of the weight bearing portion of the femoral head and secondary hypertrophic arthritic changes about the joint (Fig 199) The shoulders showed changes similar to those found in the right femur

Capillary thrombosis resulting in infarction of the involved bony area presumably is responsible for aseptic necrosis in sickle anemia Aseptic necrosis of bone in patients with sickling phenomenon and sickle cell anemia (S-S) apparently occurs with varied frequency and cannot be used

(9) Delaware M J 29 94-96 April, 1957

as differential of genetic variants of sickle cell phenomena and S-S Only electrophoresis permits separation of S-S from its genetic variants

The x ray picture of aseptic necrosis in S-S should be differentiated from caisson disease Legg Perthes disease advanced hypertrophic arthritis posttraumatic necrosis slipped femoral epiphysis and Gaucher's disease



Fig. 199 —Progressive changes, with deformity and flattening of head of right femur (Courtesy of Papastavros, C S. Delaware M. J 29 94-96, April, 1957)

Bone Infarcts in Sickle Cell Anemia in children may produce according to Caroline W Rowe and Mary E. Haggard[1] (Univ of Texas) a striking radiographic picture of extreme bone destruction and rapid rebuilding Many cases of bone

(1) Radiology 68:661-668 May 1957

infarction in persons with sickle cell anemia go unrecognized because no films are made or because of an insufficient interval between onset of symptoms and x ray examination. Cases in which bone lesions are discovered, on the other hand may be mistakenly diagnosed as osteomyelitis when the lesions are in reality uncomplicated bone infarcts

The authors observed 2 children with multiple bone in-



Fig. 200—Left arm. Initial radiograph shows destruction of radius and marked periosteal reaction. Same process demonstrated in proximal phalanx of index finger Periosteal reaction is evident along the humerus and 2d, 3d and 4th metacarpals. (Courtesy of Rowe, C. W., and Haggard, M. E. Radiology 68:661-668, May 1957)

farcts In 1 a complicating osteomyelitis was considered but not confirmed. The exact mechanism by which the infarction develops is obscure Although some investigators consider it a sequel to emboli others suggest that, pathologically only vasospasm may be demonstrated. Biopsy material obtained in one of the patients showed lymphocytic infiltration suggestive of chronic inflammation and intense osteoblastic activity indicating new bone formation

Bone changes detectable by x-rays may lag 2-3 weeks behind onset of clinical signs and symptoms In the normal tubular bone, the compact cortex is responsible for most of the density seen on the radiograph Since the shadow cast by normal bone spongiosa is relatively faint severe changes may develop here before being detected by x rays The initial radiologic picture of bone involvement consists of patchy areas of destruction in the spongiosa with periosteal reaction (Fig 200) Subsequently, there is a complete rebuilding of the shaft whereas the original shaft is ultimately completely absorbed

Early x ray changes of uncomplicated sickle cell disease may be undistinguishable from osteomyelitis congenital syphilis metastatic malignant disease Ewing s sarcoma, leukemia or even tuberculosis Follow up on 1 patient indicated that original sites of involvement which developed as oval-shaped smoothly shelled-out bone defects were significant in representing bone infarcts

Vitamin C and Diseases of Connective Tissues—*Part I*—*According to Mary Grace Blair Ward Pigman and Howard L. Holley*[2] (Univ of Alabama) scurvy caused by an insufficiency of vitamin C is a disease of the connective tissues It is thus related to rheumatic fever rheumatoid arthritis and lupus erythematosus In a search for the earliest observable symptoms of essentially complete deprivation of vitamin C 10 volunteers in Sheffield England tried a scorbutic diet, some for 10 months Crandon a volunteer in the United States lived for 6 months on a scorbutic diet In these experiments the earliest changes attributable to scurvy were hyperkeratosis of hair follicles in 17 21 weeks perifollicular hemorrhages in 26-34 weeks reddening of old scars and failure of new wounds to heal at 30 weeks and swelling and hemorrhages of the gums in 30-38 weeks The British volunteers did not become anemic during the 9 month test The hemoglobin concentration red cell count total and differential leukocyte count platelet count and bleeding time remained normal In one subject, effusions in both knees and ecchymoses of the leg developed after a long walk during the 30th week of the experiment. Two in-

(2) Rheumatism 13 52 58, April, 1957

stances of heart involvement of an undefined type occurred. Neither group of volunteers showed any increased susceptibility to infection

In the Sheffield experiment plasma ascorbic acid dropped from an initial 0 55 mg /100 ml to 0-0 03 mg /100 ml about 100 days before the appearance of clinical signs of scurvy The concentration of vitamin C in the white cells reached its lowest value 1 mg /100 Gm or less only 3-6 weeks before the clinical signs appeared Addition of 10 mg ascorbic acid/day to the scorbutic diet ameliorated the symptoms of scurvy and caused a slow rise of the plasma concentration of ascorbic acid to 0 06 mg /100 ml and of the white blood level to 2 7 mg /100 Gm during the test. At the end of the deficiency period in the Sheffield experiment, an excessive intake of ascorbic acid increased the plasma ascorbic acid to 1 mg /100 ml and the white cell level to 17 mg./100 Gm

Observations of the conditions of the gums are of some interest in connection with a critical consideration of the claims for a role of ascorbic acid deficiency in rheumatic diseases The gum lesions of scurvy in the British experiment always appeared after the skin lesions Puffy edematous and bleeding gums have also been described as a frequent but not constant finding in the mouths of patients with rheumatoid arthritis These alterations in the gums though resembling those in scurvy are not accompanied by the skin lesions of the latter However they have directed attention to the possibility of a dietary factor in arthritis In contrast Crondon s experiences imply that with good oral hygiene the gum symptoms of scurvy may be insignificant.

No relation between the anemia of rheumatoid arthritis and that of vitamin C deficiency is evident The anemia of so-called latent scurvy did not appear among the scurvy volunteers That of frank scurvy is due at least in part, to hemorrhages which cause depletion of hemoglobin and iron. The clotting time may be slightly lowered at this stage also A megaloblastic anemia described in infants deficient in vitamin C seems to be associated with a concurrent deficiency of folinic acid or related compounds

Part II—Blair Pigman and Holley[3] claim that vitamin C is one of the most perplexing of the known vitamins in regard to its actual mechanism of action The oxidative reductive interconversion of ascorbic acid and dehydroascorbic acid is readily brought about by the ions of copper and iron and by a variety of phenolic and sulfhydryl-containing compounds Both ascorbic acid and dehydroascorbic acid prevent scurvy The biologic activity may be simply a control of the oxidation reduction potential

A considerable body of data accumulated in plant chemistry is mostly compatible with but inconclusive of a role in the respiratory sequence of enzymatic actions In guinea pigs much of the radioactivity from administered radioactive ascorbic acid appears in the respiratory carbon dioxide, but man may react differently After injection of radioactive ascorbic acid into 2 human beings little if any radioactivity appeared in respiratory carbon dioxide. Urinary oxalate was an important metabolic product of the vitamin in either type subject but particularly in man From the rate of excretion the half life of the radioactivity within the body was calculated to be about 18 days in man compared with 4 days in guinea pigs

Another possible mode of action is suggested by the work of Axelrod *et al* who demonstrated hydroxylation of a variety of aromatic and heterocyclic compounds in vitro and in guinea pigs In consideration of inhibition of collagen formation in scorbutic tissues it seems worth while to consider whether ascorbic acid might also be involved in hydroxylation of proline and lysine Could vitamin C possibly be acting as a coenzyme for some hydroxylation reactions? Some observations tend to implicate the unhydroxylated acids as the precursors of their hydroxy derivatives Such an action would connect the vitamin directly with the point at which its action is most evident i e with formation and maintenance of connective tissues

The only action that appears to be reasonably well established for vitamin C in animals is as a participant in the metabolism of tyrosine in which homogentisic acid seems to be an intermediate Both hydroxylation and migration of

(3) Rheumatism 13:71 72, July 1957

a side chain are necessary for this conversion The mechanism of the reaction awaits clarification In any event, other errors in the mechanism for the breakdown of tyrosine, e.g alkaptonuria do not produce the dramatic effect on the connective tissues that is shown by vitamin C deficiency

Many enzymes can be reduced by l ascorbic acid in vitro but the vitamin can be replaced in these reactions by other reducing agents On the other hand the vitamin action in the animal body is highly specific. Thus the d antipode of ascorbic acid does not have the power to prevent scurvy, and d araboascorbic acid has only a feeble power in this regard as compared with the natural vitamin The activities of several enzymes are reported to be lower in tissues from scorbutic than in those from normal guinea pigs Chief among these are succinic dehydrogenase cytochrome oxidase and alkaline phosphatase However the observations do not seem to shed much light on the enzyme systems concerned directly with maintenance of connective tissues

Comparative Study of Xeroroentgenography and Routine Roentgenography in Recording Roentgen Images of Bone Specimens was made by Crawford J Campbell John Roach and Andres Grisolia[4] (Albany Med College)

METHOD —Sections 1 cm thick were taken from 30 normal and diseased bones and joints The xeroroentgenograms were recorded photographically by 2 × 2 in. Kodachrome film. The resulting photographs were enlarged to the exact size of the routine roentgenograms By use of celloidin embedding microscopic slides were made of all specimens for comparative purposes.

In xeroroentgenography an electrostatic image of the size, shape and radio density of the interposed object is produced on a xeroplate which is a metallic plate coated with a semiconductor such as selenium The image is made visible by placing finely divided powder granules on the charged pattern of the xeroplate

Four characteristic examples of specimens studied are presented The authors found more pronounced definition and contrast gradation in the xeroroentgenogram than in the routine roentgenogram (Figs 201 203) This is caused by an increase of powder on one side and a decrease on the other side of the boundary of the electrostatic charge on the xeroplate In the area of decreased deposit the fine details of the

(4) J Bone & Joint Surg. 39 A 577 582, June, 1957



Fig. 201 (left) —Roentgenogram.
Fig. 202 (center) —Xeroroentgenogram.
Fig. 203 (right) —Pathologic section.
(Courtesy of Campbell, C. J *et al.*: J Bone & Joint Surg 39-A:577 582, June, 1957)

bone may be diminished or obliterated This has been termed the pull in effect The soft tissue detail is more marked in the xeroroentgenogram than in the roentgenogram This feature can be an aid or hindrance depending on the nature of the tissue under investigation

Observations on Value of Clinical Electromyography are presented by Benjamin L. Crue Robert H Pudenz and C Hunter Shelden[5] (Huntington Mem'l Hosp Pasadena Calif) The electromyogram is of use in the diagnosis of lesions in which demonstration of minimal lower motor neuron disease is important. Although electromyography is in no sense a substitute for a complete history and careful physical and neurologic examinations it sometimes leads to a significant finding previously overlooked or indicates the need for further investigation

Perhaps the most frequent use of electromyography at present is in the syndrome of herniated lumbar interverte-

(5) J Bone & Joint Surg 39 A 492 500 June, 1957

bral disk. Here its accuracy compares well with that of Pantopaque* myelography and clinical localization. Electromyography is simpler than myelography as a preliminary screening test. Clinical localization, myelography and electromyography used separately are correct in only about two thirds of cases, but there is a greatly reduced chance of error in diagnosis when all three methods are used in combination. In 136 consecutive cases of herniation of the nucleus

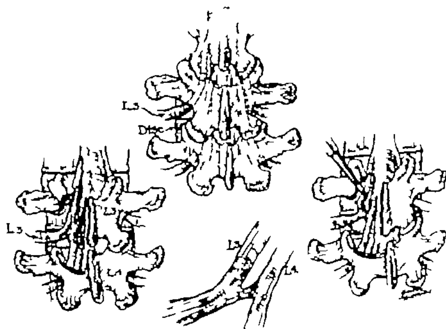


Fig. 204.—True "plexus" inside spinal canal involving 3d and 4th lumbar nerve roots. (Courtesy of Crue, B. L., et al. J. Bone & Joint Surg. 39-A:492-500, June, 1957.)

pulposus at the 4th to 5th lumbar interspace and the 5th lumbar to the 1st sacral interspace, a preoperative error in localization of the involved disk was made only once. Utilization of all three methods should preclude lumbar exploration with routine exposure at multiple levels.

The electromyogram is of value in various other conditions, e.g., herniated cervical disks, plexus injuries, peripheral nerve injuries, degenerative diseases of the spinal cord and inflammatory diseases such as poliomyelitis. The authors present 13 cases illustrating its clinical usefulness. Case 12, given here, is an example of a case in which it is difficult to interpret the electromyographic findings. Dif

ferentiation between a rare 2d or 3d lumbar nerve root lesion by electromyography is more difficult than when lower lumbar roots are involved

Woman, 49 had had recurrent back pain for 4 years. Two months before hospitalization after lifting a heavy weight, she had pain in the back and anterior portion of the left thigh. All movements of the spine referred pain to the upper part of the thigh Examination revealed a diminished left patellar reflex but no sensory changes Electromyographic findings were consistent with approximately 10% involvement in the area of the 3d lumbar nerve root on the left. The myelogram revealed a slight lateral indentation at the 3d to 4th lumbar level on the left. At laminectomy it was decided to examine the 3d to 4th lumbar level first. A very small but definite lateral herniation of the disk was found (Fig 204) The 3d lumbar nerve root, instead of sweeping laterally and superiorly under the 3d lumbar vertebral pedicle, was pulled down and held over the protrusion by what appeared to be an adhesion to the 4th lumbar nerve root. On careful dissection however a partial plexus was found inside the spinal canal, and what appeared to be an adhesion was a true sheath containing nerve fibers from the 4th lumbar nerve root joining the 3d lumbar nerve root The disk was removed, and the nerve roots were not separated. The patient made a prompt recovery

Induced Hypoadrenalism in Patients Requiring Orthopedic Surgery is discussed by James A Nicholas, Philip D Wilson and Charles J Umberger[6] (Cornell Univ) Prolonged administration of steroids often but not always results in adrenocortical insufficiency It has been difficult to determine whether a patient so treated is actually without adrenocortical function Elective surgery on bones and joints in such a patient should be postponed until the adrenal status is ascertained and until the steroid has gradually been discontinued if necessary

To assess adrenal status the authors studied the measure of salt conservation after an intravenous infusion of corticotropin (ACTH) The amount of salt excreted in the urine/ 24 hours is measured for 48 hours during which time the salt intake is calculated and restricted to not over 3 Gm / 24 hours Blood electrolytes, 24-hour urinary potassium and sodium excretion are also measured After the 48 hours an infusion is given of 50 mg corticotropin in 500 cc. dextrose and water over 4 hours Then in the next 24 hours, at 12 and 24-hour periods the total urinary salt excretion and blood electrolytes are recorded

(6) J.A.M.A. 164:261 265 May 18, 1957

If the patient has normal adrenal function the amount of salt excreted in the urine in the 24 hours after this test will decrease by 50-75% of that in the control period Since the average person normally excretes about 100 mEq salts/day/L urine, usually the excretion in the urine will not exceed 40-50 mEq/L over the 24 hours after the infusion. Therefore, if the amount excreted fails to decrease, this failure to conserve salt after the test with corticotropin should alert one to the possibility of hypoadrenalism This condition is especially likely if after the infusion of corticotropin, no hypokalemia no slight rise in the plasma level of 17-hydroxycorticoids and no transient eosinopenia develop all of which occur in the normal person The absence of these particular changes in response to corticotropin provides a useful indicator that supportive steroid therapy may be required Clinically the presence of asthenia and hypotension is doubly significant especially if the patient has received adrenocortical steroids for over 3 months

Orthopedic surgery was performed on 10 patients who had been receiving steroids (for 7 years in 1) The test was carried out in 9 and revealed adrenal insufficiency in 6 Diagnosis was borne out by the occurrence of shock in 4 patients and by the effectiveness of hydrocortisone given intravenously in combating it.

Elective surgery may be postponed for several months to permit weaning but if emergency surgery is required in a patient who has been receiving cortisone increased amounts of steroid will be needed during and after operation

Cystic Adventitial Degeneration of Popliteal Artery, found in 4 men aged 24-32 is described by Tor Hiertonn and Kaj Lindberg[7] (Karolinska Hosp Stockholm) In each the abnormal segment of the artery was resected and successfully replaced by a blood vessel transplant The arterial wall above and below the lesion was intact The prognosis was estimated to be better than in patients with arteriosclerotic changes i e thrombosis and aneurysmal formation

Factors common to all cases were (1) occurrence in young men (2) sudden onset with cramps in the calf and no history of trauma (3) intermittent claudication (4) lo-

(7) Acta chir scandinav 113 72 77 1957

cal stenosis and/or occlusion of the popliteal artery (5) absence of general arterial changes (6) intramural cyst formation outward to the media compressing the arterial lumen (7) gelatinous cystic contents under high tension (8) flattened cells lining the walls of the cyst formation and (9) structures of the cystic wall suggestive of mucinous degeneration

On the basis of microscopic examination hemorrhage and inflammation must be abandoned as causative factors The cause is unknown It is however reasonable to believe that repeated minor traumas of the popliteal artery may contribute to this bursa like formation within the adventitial layer

Marfan s Syndrome Report of Three Patients with Aneurysm of Aorta is presented by Elias G Pappas Daniel Mason and Clarence Denton[8] (Philadelphia) Marfan s syndrome is characterized clinically by an abnormal lengthening and thinning of the fingers toes and long bones a prominent long palate relaxation of the ligaments loss of subcutaneous fat poorly developed hypotonic musculature asthenic body build a dolichocephalic head with old appearing features kyphosis funnel shaped chest and subluxation of the lens of the eye Cardiac abnormalities such as septal defect valvular lesions or aneurysm of the aorta are found in 46% of patients There is yet no proof of a common pathogenesis of dissecting aneurysm with and without Marfan s syndrome These cardiac lesions may simulate rheumatic heart disease or rheumatic valvular lesions may be superimposed Pulmonary anomalies are frequent Some patients do not show the typical syndrome and a forme fruste may be present The disease is familial

The authors report 3 cases (2 men and 1 woman aged 32-45) of arachnodactyly complicated by aneurysm of the aorta Autopsy showed a tear in the wall of the aorta without dissection in 1 case The basic pathologic lesion in the aorta was a cystic mucinous degeneration of the media similar to that described in the literature This may easily lead to massive dilatation of the aorta and the aortic valve annulus with resultant insufficiency at the valve orifice even if the leaflets are normal Dissection of the aortic wall

(8) Am. J Med. 23 426-433 September 1957

may readily occur under these circumstances Generalized aneurysmal dilatation of the aorta was present in all 3 cases with aortic insufficiency

Bone Salt Metabolism in Humans Studied by Means of Radiocalcium. Goran C H Bauer Arvid Carlsson and Bertil Lindquist[9] computed the accretion rate of bone salt in the entire skeleton from activity determinations of serum samples and excretion (urine plus feces) of 14 patients with normal skeletons In addition the magnitude of the exchangeable calcium was calculated

The principles for computation were taken from a previous study (Bauer Carlsson and Lindquist, 1955) Results of tracer studies with isotopes of Ca P Sr and Ba suggested that from a kinetic standpoint the body calcium exists in two principally different fractions One comparatively small fraction is exchangeable and the other—the major fraction of the skeletal calcium—is not Radioactive calcium introduced in the blood stream mixes with the entire exchangeable calcium and is incorporated into the nonexchangeable calcium fraction by accretion of new bone

Results showed that in blood activities the specific activity of calcium in the serum was the same in all patients as that of the urine collection corresponding to the serum sample The specific activity of the serum (urine) calcium declined rapidly after injection After this initial rapid fall there was a slower exponential decline This final exponential (k_3) adequately described the fall in blood activity in adults from 1 to 2 to about 10 days The rate constants of the exponentials were lower in the adults than in the children The mean value for the final exponential function (k_3) in the infants was 0 45 for the older children 0.20 and for the adults 0 16 The corresponding values for k_2 in the same age groups were 4 5 2.9 and 2 4 respectively Except in 1 adult there was a factor of about 10 between these two constants (k_3 and k_2) When the k_2 value of this patient was disregarded the mean value of this constant in adults was 2 0 Blood determinations were carried out on only 3 patients at intervals sufficiently short for computing another fractional constant (k_1) The mean was 11.3

The mean value for the excretory rate of adults was 0 35

(9) Acta med. scandinav 158 143-150 1957

expressed as grams of calcium/day In children this value was smaller

The accretion rate in normal skeletal metabolism rose with increasing age to a maximum during adolescence and then slowly declined to a level of about 0.5 Gm calcium/day This finding of the higher values in adolescence is in agreement with the results of other authors

The size of the exchangeable fraction in 2 infants was 0.78 and 1 1 Gm calcium respectively In the adults the mean value was 5.3 Gm calcium

Observations on Use of Sympathetic Nerve Blocks in Orthopedic and Traumatic Surgery Richard L. Fenton Bernard Vina Wetchler and Glenn R Weygandt[1] (US Army Hosp., Ft Bragg N C) used sympathetic blocks as an adjunct to treatment of orthopedic and traumatic conditions

METHOD—Patients were chosen because of severe trauma and/or extensive surgery or because of excessive swelling pain, stiffness and vascular spasm. When used in hopes of preventing such symptoms a sympathetic block (stellate for the upper and lumbar sympathetic for the lower extremity) was given immediately after surgery or within 24 hours and repeated every 24 hours for 3-5 days When used to reverse already established symptoms a block was given and the patient was told to return to the anesthesia department in 24 hours. If pain had recurred, a second block and similar instructions were given. If no pain recurred after 24 hours the patient was re-examined. If the limb was normal blocks were discontinued. If swelling coldness or stiffness had recurred or persisted, a second block was given. This procedure was repeated as long as necessary

Usually 3-5 blocks sufficed often 1 2 relieved all signs Rarely more than 5 blocks were needed. If there was no response after 2 3 blocks treatments were discontinued. Relief for 6-12 hours often occurred after the first injection and for 24 hours after the second permanent relief was noted with the third. During the period of treatment, physical therapy was given whenever feasible

With this method the authors were able to minimize swelling stiffness and pain Many patients required little or no narcotics after blocks even though pain was considerable before nerve block In most others it was possible substantially to reduce postoperative narcotics Patients with already established swelling duskiness stiffness pain and dry shiny skin persisting several weeks after surgery or trauma were relieved of these symptoms often after only 1 2 injections

(1) Surgery 41 478-487 March, 1957

Evaluation of Sympathectomy in Treatment of Peripheral Arterial Occlusive Disease and Reflex Sympathetic Dystrophy Anatomic, Physiologic and Clinical Observations are presented by Daniel F Casten and Bernard Freundlich[2] (New York) Results following sympathectomy for arterial insufficiency depend on many factors nature of the disease process type of symptomatology presence or absence of a

TABLE 1—RESULTS OF SYMPATHECTOMY FOR ARTERIOSCLEROTIC PERIPHERAL VASCULAR DISEASE INVOLVING LOWER EXTREMITY

Clinic	No. of Pts.	Sympathectomy		Symptoms			Results				Mortality
		High	Low	1	2	3	Good	Fair	Poor	Amp.	
Duke Univ	28	21		19			19			2	
			5			5	4		1	1	
Evanston Hosp	47	29					18			9	
			31				21			8	
Univ of Michigan	275		307	41			20		15	4	2
					67		27		19	18	3
						165	47		21	97	3
Univ of Maryland	396		400				128				
								110			
									158	97	11
VA Hosp Miami	51	18					14		1	3	
			50				27		15	8	
St Lukes Hosp	32		32	16			13	3			1
						16	8	1	10	9	
Seattle Wash	44		44	44			25	11	7	7	1

Symptoms intermittent claudication with no rest pain; mild to severe rest pain in addition to claudication tissue necrosis and/or frank gangrene.

vasospastic element degree of occlusion presence of ischemic changes and extent of sympathetic denervation Reported results vary widely (Tables 1 and 2) probably because of differing methods of classifying patients and different criteria for selecting patients for surgery

The nature of the disease causing arterial insufficiency affects the life expectancy of the patient as well as that of the involved extremity Some types of arteriosclerotic disease are virulent and cause death either months or a few

(2) Bull Hosp Joint Dis. 17:251-270 October 1956.

years after onset of occlusive symptoms Others pursue a more benign course and are compatible with prolonged survival of life or limb In general, arteriosclerotic disease of slow or insidious onset with segmental arterial occlusion offers the best prognosis Also obliterative disease of the aortic bifurcation particularly in younger men, is seldom accompanied by necrosis of tissue and likewise offers a better prognosis Opinion concerning diabetic arteriosclerosis obliterans varies widely Some feel that diabetes does not alter the prognosis appreciably In the authors experience

TABLE 2—EFFECT OF LUMBAR SYMPATHECTOMY ON LEVEL OF AMPUTATION

Clinic	No. of Patients	Sympathectomy			Amputation			Total
		High	Low	None	Above knee	Below knee	Trans met	
Evanston Hosp	47	29	31		2	7		9
Maryland Univ	200		400		7	1		8
Ochsner Clinic	227		177			55	42	97
St. Vincents	309	300		180	35	24	3	137 62

the association of diabetes with arteriosclerosis obliterans increased the amputation rate noticeably (Table 3)

Vasospasm as the primary cause of arterial insufficiency as in Raynaud s disease or as a contributing factor improves the prognosis for limb survival The vasospastic factor which can be determined preoperatively by appropriate paravertebral procaine blocks is completely amenable to sympathetic denervation In these patients pain is relieved exercise tolerance is increased and limb survival is almost assured. An appreciable rise in local skin temperature after a single or continuous procaine sympathetic block augurs well for a satisfactory postoperative result

Claudication is often relieved by sympathectomy if unaccompanied by severe ischemic necrosis These patients obtain the best result from surgery Also the pain of ischemic neuritis and rest pain can be relieved frequently by operation, although pain due to gangrene of peripheral tis-

sue is rarely ameliorated Often patients with arterial insufficiency complain of severe pain although no evidence of neuritis is present This may be due to local lack of heat in the tissues since the patients often obtain relief by holding their feet or toes This type of pain also is frequently relieved by sympathectomy

The extent of arterial occlusion as shown by arteriography influences the end results because of the effect on collateral circulation The segmental type of occlusion yields

TABLE 3.—Result of Sympathectomy in Diabetic Patient

Clinic	No. of Patients		Gangrene	Results			Mortality
	Diab.	Non-diab.		Good	Poor	Amp.	
Marquette U	33		15			18	
		81	7			14	
Univ of Mich	93		None	29	15	43	2
		182	None	65	40	71	6
	76		Present	23	10	43	2
		80	Present	24	11	54	1
St Lukes	11			6		5	
Edwards & Crane	27		26	23		3	2
Philadelphia General	9		8		2	2	5

Refers to number of extremities in this case only

the best results even in aortic bifurcation occlusion provided the proximal and distal segments are patent

Ischemic or local gangrene is the greatest limiting factor to the success of sympathectomy Such tissue changes are irreversible and if associated with infection, rapidly progress upward making major amputation mandatory Sympathectomy should be performed only when successful transmetatarsal amputation is possible. In selected patients the results can be improved if the lower 1st or 2d thoracic ganglions are removed with the lumbar chain

In reflex sympathetic dystrophy the best results are obtained by prompt diagnosis and evaluation of the severity of the disease immediate or early institution of sympathetic blockade and accurate evaluation of the results of blocking

procedures to avoid delay in surgery in those patients whose response is poor or transitory The development of fixed pain patterns or irreversible tissue changes is an absolute limitation to the effectiveness of therapy

PLASTIC SURGERY

Edited by
NEAL OWENS M D

RECONSTRUCTION

Total Reconstruction of Ear Lyndon A Peer and John C Walker Jr[1] (St Barnabas Rehabilitation Center Newark N J) state that a child born with a deformity of the external ear and absence of the ear canal and ear drum presents a problem to the pediatrician otologist and plastic surgeon Roentgenograms of the temporal bone reveal the probable presence of an internal ear with evidence of a middle ear cavity and the suggestion of a bony outline in the area of the external auditory canal Accurate determination of the presence of the external canal is difficult in an infant Exposure of the drum membrane to improve hearing should be discouraged because in typical meatal atresia it is never normal and surgery will usually add scar tissue and occasionally facial paralysis to the problem

The external ear and middle ear develop together and therefore congenital anomalies of one often involve the other The internal ear develops separately and usually is not involved For this reason children with absence or deformity of the auricle associated with meatal atresia usually have normal bone conduction Psychogalvanometric tests will help to demonstrate hearing on the affected side Bilateral meatal atresia presents a more difficult problem The formation of skin lined openings into the antrum will facilitate hearing and aid in earlier speech In general it is more advisable to first try hearing aids as early as co-operation permits The authors have never found fenestration necessary

In severe deformities of the external ear the auricle may be completely absent except for the lobe which is usually

(1) J Internat. Coll. Surgeons 27 290-304 March, 1957

displaced forward or downward The upper portion of the lobe may be connected with varying amounts of distorted cartilage There may be also small skin tabs with cartilaginous understructure situated on the cheek or in the neck. These represent abnormal branchial rests

Reconstruction of the auricle may begin at about age 3½ years This should enable the child to enter school at age 5 without a physical handicap or psychosocial maladjustment. The new ear is made only slightly larger than the normal one

Although reconstruction of an auricle remains one of the most difficult problems in plastic surgery developments in this field in the past 15 years have resulted in a general improvement in postoperative results The various technics basically are quite similar In the past 22 years the authors have constructed 80 auricles using autogenous and homogenous cartilage Diced cartilage grafts pre formed in a perforated Vitallium mold buried beneath the abdominal skin were used to construct 65 auricles The pre formed replica of the normal ear cartilage is transferred as a solid ear structure beneath the skin in the region of the absent ear Fresh autogenous cartilage is the material of choice for this procedure If homogenous cartilage is used and extruded, further attempts at reconstruction are usually too difficult Homogenous cartilage may be used in older patients when it is inadvisable to use their own costal cartilage

The authors obtained satisfactory results in 80% of the 65 auricles constructed with the diced cartilage technic. The poor results were often due to improper management and most of these occurred in the first 40 cases Reconstruction was satisfactory in 9 of the last 10

Reconstructed auricles were generally satisfactory in contour angle and lobe relation with the normal ear at conversational distances Closer inspection reveals a somewhat thicker structure with loss of fine contour of crura and concha.

Long term observations of foreign material implants and further knowledge of the cause of rejection of homogenous and heterogenous cartilage grafts and the means to prevent this host reaction should be appraised The use of heterogenous ox and sting ray cartilage is still experimental A

mixture of homogenous and autogenous cartilage may actually be desirable in the diced cartilage technic, because gradual absorption of the homogenous elements tends to thin out the structure to some extent

Cheilitis Glandularis with Reconstruction of Upper Lip Reed O Dingman and Arthur C Curtis[2] (Univ of Michigan) call attention to a report on this disease by Volkmann

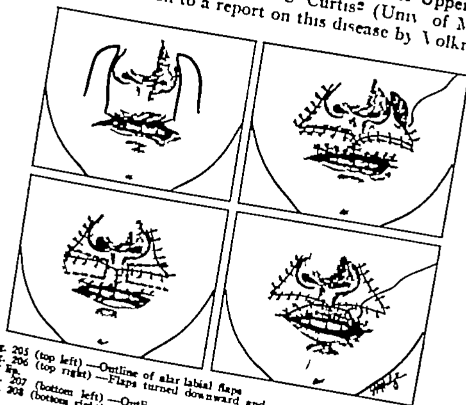


Fig. 205 (top left) —Outline of alar labial flaps
Fig. 206 (top right) —Flaps turned downward and medially for reconstruction of upper lip.
Fig. 207 (bottom left) —Outline of incisions for advancement of labial mucosa.
Fig. 208 (bottom right) —Trimming of flaps and suturing of mucosa to skin margins.
(Courtesy of Dingman R. O and Curtis, A C Am. J Surg 92:908-914 December 1956.)

in 1870 This study was based on 5 adults whose lower lip gradually became painlessly swollen hard and firm Hyperemia of the skin and mucous membranes adjacent to the lip with enlargement of the mucous glands was noted The glands could be palpated through the mucosa and their widely dilated ducts could be seen when the lip was everted. Pressure caused a glistening secretion to exude from the duct openings but little discomfort. None of the patients had ulcers or plaques on the lip but 3 had abscess forma

(2) Am. J Surg. 92:908-914 December 1956.

tion with fistulas draining to the surface Therapeutic agents found to be effective in 3 patients included potassium iodide internally with potassium chlorate mouthwashes and local applications of silver nitrate Additional cases with similar clinical findings have been reported by Purdon (1893) and Sutton (1909) Either the lower lip or both lips were affected

Dingman and Curtis report a case in a girl 16 in which antibiotics cautery, antiseptic wet dressings steroid therapy and irradiation failed to produce a permanent cure. Psychiatric and allergy work ups were negative The condition is an inflammatory disease of the mucous glands of the lips In this case trauma from the mouthpiece of a trombone played daily could well have initiated it Infection and blocking of the glandular orifices by crusts and inspissated mucus are secondary factors Biopsy revealed subacute and subchronic ulcerating lesions in various stages of healing In earlier material lack of chronicity was noted The patient was treated conservatively over 2 years during which the lips became progressively scarred to the point where the mouth measured 3 cm in diameter The dense scarring necessitated surgical excision of the upper lip and reconstruction by rotation of local cutaneous and mucous membrane flaps (Figs 205 208)

As cheilitis glandularis is sometimes self limiting conservative management is recommended with surgery in intractable cases

Management of Facial Injuries According to F X Paletta[3] (St Louis Univ) the incidence of facial injury is on the increase Few patients die as the result of such injury except those with severe bleeding or respiratory obstruction. Hemostasis and establishment of a good airway therefore are of primary importance

Most bleeding from the face and scalp can be controlled by firm pressure with ligation later at the time of surgical repair Nasal bleeding may be severe but can be controlled by intranasal or pharyngeal packing Oral bleeding can be controlled by closing the mouth over a sponge before repair but a good airway must be present. Major bleeding from the neck is controlled by finger or sponge pressure

(3) Mississippi Valley M J 79 150-153 May 1957

before actual ligation If oral bleeding interferes with respiration the patient may be placed on his side or abdomen Tongue aspiration can be prevented with the use of a towel clip safety pin or tongue suture Tracheotomy is indicated



Fig. 209—Patient with cerebral, facial and chest injury resulting from automobile accident. Pneumothorax was treated by drainage with tubes. Facial bones, practically all fractured, were positioned and fixed after cerebral and thoracic injuries were controlled. (Courtesy of Paletta, F X Mississippi Valley M J 79 150-153 May 1957)

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Once hemostasis and an airway have been established examination of the head chest and abdomen is undertaken Injuries of these parts take priority over facial injuries

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(Fig 209) Early diagnosis is necessary for the best results in treatment Palpation can usually determine what bones are fractured Roentgenograms are confirmatory and are useful from the medicolegal aspect Fractures of the nasal and zygomatic bones are easily reduced if treated within the first 24 hours Delay of several days may necessitate refracture Early reduction with fixation of fractures of the mandible and maxilla minimizes swelling and prevents complications Local anesthesia is the choice in facial injuries. General anesthesia if necessary should be delayed until cerebral, chest or abdominal injuries have been evaluated.

All open wounds should be thoroughly irrigated to remove foreign body material generally the cause of infection. Glass is the usual offender

Four types of injuries should be looked for rhinorrhea, injury to facial nerves laceration of Stensen's duct and severance of lacrimal ducts Facial nerve injury is difficult to diagnose under anesthesia. Injury to the facial nerve, Stensen s duct and lacrimal ducts are best treated by immediate repair In most cases of rhinorrhea drainage will stop spontaneously although neurosurgical consultation is advisable in all cases

Debridement of facial skin should be minimal in excision of the irregular edges of the wound. Careful approximation of wound edges with fine silk and needle is necessary for best results Repair is best done within the first few hours, but it can be delayed several hours until internal injuries have been ruled out and shock treated

► [Too much emphasis cannot be placed on the importance of adhering to fundamental principles in caring for wounds of the face.—Ed.]

Reconstruction of Subtotal Nasal Defects In addition to the usual congenital infectious and neoplastic deformities the nose because of its central exposed position is subject to traumatic injuries Gerald Brown O Connor and Mar W McGregor[4] (San Francisco) discuss the various causes of nasal defects pointing out that congenital deformities allow tissue replacement in a scar free bed whereas infectious processes leave considerable scarring

The age of the patient is a factor in repair as the problem of growth of the part must be considered in young patients

(4) Am. J S rg 92 57-60 July 1956.

Existing scars affect the available tissue donor areas Other factors in reconstruction include the character of the lesion sex and appearance of the individual type of employment and financial status and time available for operative repair

The necessities and goals of reconstruction include (1) close donor area (2) adequate availability of material (3) color match and lack of hair bearing elements (4) replacement with like tissue (5) minimal scarring and deformity of exposed donor areas (6) an adequate bed for supportive material and (7) lining of exposed surfaces of permanent nasal flaps

Injuries with minimal loss may be primarily repaired with the remaining tissue or with contiguous flaps or cartilage grafts free skin or composite grafts to reconstruct the defect

Free split thickness grafts for lining or temporary cover may be had from the upper arm chest or thigh Thin and hairless skin is provided but only a fair color match results Full thickness free grafts are obtained from the upper lid and preauricular auricular postauricular and supraclavicular areas These offer good color match and hairless donor areas with hidden residual scars

Reconstructive Problems of Chest and Breast. The commonly used technics for repair of breast and chest wall defects are presented by Kathryn Lyle Stephenson and Jack M Moselys (Santa Barbara Calif) with their modifications In rehabilitation of hypomastia combined with vaginal agenesis breast form reconstruction may be almost as fundamental as creation of a vagina Utilization of fascia fat-derma adjacent flap transplants is a more reliable method of reconstruction of the undeveloped breast superior to the free transplant of fat fat and fascia or fat and derma to the submammary space Maintenance of the blood supply of the graft lessens the possibility of loss from infection or shrinkage The less obese patient gives a better result because there is less dissolution

The technic involves bilateral removal of the epidermis over a crescent shaped area beneath the breast The inferior incision is extended through the corium and undermined to the thoracic cage margin mobilizing fat and fascia to

(5) Am. J Surg. 92.26-36 July 1956

swing upward with dermis fat fascia The breast tissue is elevated, and these flaps are mobilized and attached to the chest wall The superior quadrant may be augmented by a small free derma fat fascia graft transplant.

After simple mastectomy for chronic cystic mastitis, reconstruction is performed by retaining the excess corium and fat as flaps utilizing the principle of the preceding operation The nipple is carefully dissected as a free graft and re-embedded after removal of epidermis and part of the dermis

Reduction of the hypertrophic breast should be performed in a single procedure The proposed nipple site and reduction are planned with the patient upright, and a semirecumbent operative position is used for a continuous check. Various landmarks and methods of calculation have been used to relocate the nipples and breasts with variation of ideal location due to allowance for postoperative readjustment caused by gravity Nipple necrosis is prevented by not undermining the breast beneath the nipple and avoiding tissue removal in proximity to the nipple Resection of superior-central and inferior medial and lateral wedges of tissue permits preservation of the lateral thoracic and internal mammary arteries along with adequate reduction in size Postoperative flattening of the breast in free nipple transplantation leads to a superiorly displaced nipple. Correction is made through a submammary incision elevating skin and nipple by mobilizing the upper and lateral portions of the breast and imbricating the medial sector on the lateral to recreate a central fulness

Gynecomastia is corrected by excision of breast tissue through a semicircular periareolar incision The most reliable substitute for total loss of the nipple is transplantation of labial tissue The fundamental procedure for inverted nipple consists of elevating the areola and nipple everting the nipple and maintaining it in its new position by excising wedges of tissue to form a tighter base

Severe scarring of the chest wall from a burn often leads to flattening of the breast with displacement of the nipple due to contracture Reconstruction is done with adjacent chest or abdominal fat and fascia with due regard for the size of the remaining breast After postmastectomy radiation

injury an abdominal flap or one raised from the remaining breast will bring in the necessary blood supply

Reconstruction of chest wall defects presents the problems of respiratory motion with need of stability of the thorax Small defects can be managed with periosteal flaps intercostal muscle and divided adjacent ribs Larger defects are closed with decorticated autogenous or homogenous ribs with ends left alone so that heavy chromic catgut sutures can hold them to the adjacent ribs Mobilized local musculo fascial pedicles close the pleural defect A rib strut can be used in the above fashion to repair the sternum in pectus excavatum

Principles of Reconstructive Surgery of Hand J William Littler[6] (New York) highlights some of the factors conducive to greater rehabilitation of the injured hand Skin loss and cicatricial contracture are the main causes of deformity Unhealed skin areas invite infection deep necrosis and prolonged disability A free or pedicle graft may be required for wound closure but the inevitable cicatricial border contracture and possible joint restriction can be reduced by careful placement of incisions Free grafts are often necessary for closing areas where a pedicle graft may ultimately be needed The borders of the secondary flap should be placed midlaterally to joints and parallel to flexion creases

The presence of sensation in many grafted areas is vital to usefulness of the part Skin with sensation must be preserved and shifted if possible to the working aspect of the digit. A neurovascular pedicle skin island transfer may be necessary to provide sensation where it is most needed

Full thickness thermal burns and avulsion injuries with exposure of deeper structures demand resurfacing often with a combination of free and pedicle skin Free grafts are excellent for the dorsum of the hand but pedicle skin is generally required for the thumb web and volar aspects A syndactylism must be created when a pedicle flap is required to resurface multiple digits on the dorsal or volar aspect After resurfacing is completed separation of the digits is not always necessary when only proximal phalanges remain.

(6) Am. J Surg. 92:88-93 July 1956.

The foremost considerations in initial treatment are closure of wounds and a careful functional positioning of the hand Prolonged immobilization in malposition is a common cause of disabling contractures A flexed wrist increases the extensor pull on the proximal phalanges thereby favor

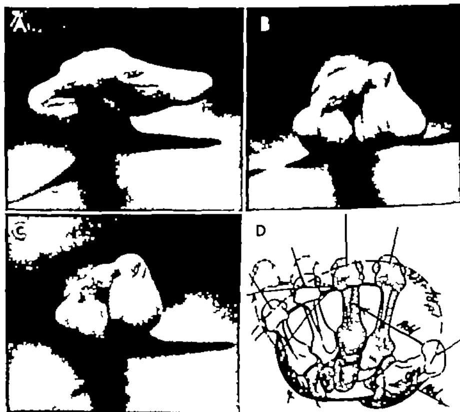


Fig 210 —Fundamental structural and functional aspects of human hand can best be understood through simple analysis of its transverse and longitudinal arch mechanism. Both arches have fixed and adaptive components. Transverse carpal arch and 2d and 3d metacarpals form fixed proximal unit (dotted segment of *D*) Transverse metacarpal arch is formed as extension of carpal arch but is made adaptive or variable through 1st, 4th and 5th carpometacarpal articulations. Although 1st metacarpal is independent, 4th and 5th are linked to central fixed 2d and 3d through intermetacarpal neck ligaments. Transverse metacarpal arch is developed by opponens pollicis and opponens digiti quinti muscles which originate from hooks of greater multangular and hamate bones, respectively and from volar carpal ligament (*A-C*) (Courtesy of Littler J W Am. J Surg. 92.88-93 July 1956.)

ing metacarpophalangeal hyperextension and secondary contracture of the collateral ligaments When the thumb is in the adducted position web skin fascia and intrinsic muscle contracture are initiated The flat extended hand disrupts and reverses the normal longitudinal and transverse arch mechanism thereby destroying the capacity to encompass and grasp objects (Figs 210 and 211)

Plaster is used for immobilization and never as a tourniquet Ischemia from arterial damage may produce a Volkmann contracture especially when arterial insufficiency is combined with venous obstruction and external pressure from an unyielding plaster

Transient edema accompanies all trauma to a degree but when it is prolonged the effect on the normal mobile hand is disastrous gliding surfaces suffer and the hand is stiffened. In extreme cases organized fibrin is deposited espe

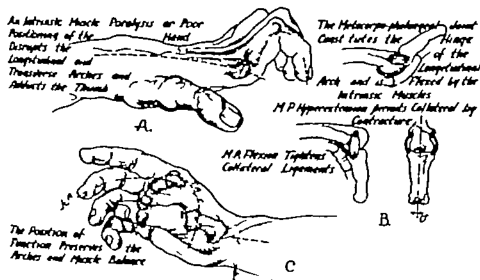


Fig. 211 —Longitudinal arches are formed by 5 rays (*C*) Like transverse metacarpal arch, distal or adaptive segment of longitudinal arch is maintained by intrinsic muscles bridging fixed metacarpal and adaptive phalangeal segments t metacarpophalangeal joints. This prime joint forms "hinge" of longitudinal arch. When intrinsic muscles re paralyzed, break in arch results and proximal phalanges of thumb and fingers go into hyperextension (*A* and *B*) (Courtesy of Littler J W Am. J Surg. 92 88 93 July 1956.)

cially in the subcuticular layers of the skin and a frozen hand may result Atraumatic reparative surgery performed in a bloodless field, including careful reduction and fixation of fractures and above all complete skin closure through free or pedicle skin grafting if necessary is a primary requisite. Open wounds are conducive to edema and excessive fibrosis Optimum compression of the dressing supports tissue and aids in prevention of postoperative hematoma but does not produce skin necrosis Blood pressure determinations on the operated arm are avoided during recovery Post operative elevation of the hand and relief of any constriction facilitate venous and lymphatic return Congestion and

swelling are thereby largely prevented and pain is minimized

Management of any one damaged part must not jeopardize intact structures and care must be taken not to convert a minor problem into a major one This is especially true when too much surgery is inflicted on already traumatized tissues especially in limited areas Since fibroblastic proliferation is the basis of repair in all connective tissues all specialized parts traumatized in a given area can be united by a common cicatrix with loss of independent function This is not infrequent at the wrist where consolidation of nerves and tendons often follows the added trauma of extensive repair In severe lacerations at the wrist the structures to be united primarily are the terminal phalangeal flexors and the median and ulnar nerves All other structures can be relegated to a relatively insignificant status with respect to these all important structures essential for the best in hand function namely sensation intrinsic muscle power and interphalangeal flexion

In gross subtotal amputation of the hand an opposing unit can be reconstructed with an iliac bone graft and abdominal flaps provided there is one mobile element Intact functional elements must be preserved and mobilized and available power and sensation must be concentrated where most needed. The hand is of necessity reduced to a lower functional status but gaining the primary element of grasp is a significant achievement and contributes manual independence to the patient

► [An excellent presentation of important fundamentals in the management of injuries to the hands —Ed.]

Correction of Nasal Deformities Due to Defects of Septum. Reed O Dingman[7] (Univ of Michigan) advocates anterior and or posterior septal reconstruction with external rhinoplasty as a one stage procedure when possible, for coexisting deformities of the internal and external nasal structures Septal defects may be traumatic postoperative developmental or congenital Careful planning and execution are necessary to assure a quiet patient and a bloodless field These requirements can be met by adequate preoperative analgesia and operative anesthesia properly timed and administered

(7) Plast. & Reconstruct. Surg. 18 291 304 October 1956.

The combined operation is a two step procedure planned to give the greatest access to the field Transseptal and intercartilaginous incisions are made extending from the floor of the nose to the dorsum of the cartilage on the con vex side When vomeral dislocation has occurred ob structing the airway the overhanging cartilage is excised Buckling or curling of the anterior edge is corrected by cross hatching or V strip excision After the spring is re moved from the cartilage the cartilage will hang suspended like a curtain attached to the mucoperichondrium of the other side Vomeral fracture and manipulation may be nec essary Posterior septal deformities are excised by the usual submucous resection procedures Septal fixation to the an terior nasal spine or periosteum by wire or gut may be nec essary

After reconstruction of the anterior septum the triangular and alar cartilages are corrected The anterior septum is shortened if necessary and attached to the columella with mattress sutures Losses or dislocation of the dorsal por- tion of the quadrilateral cartilage may cause a depressed effect which may be corrected by eversion of medially based flaps from the triangular cartilages Additional height may be obtained by widely undermining the triangular cartilages pulling them tent like over the previously everted medially based flaps and suturing them together beneath the skin in the midline Smaller defects may be corrected by advance- ment of the triangular cartilages without eversion or by free autogenous or homogenous septal cartilage grafts

If the nose is long defects of the lower cartilaginous dor sum may be built up at the time of septal shortening by reflected flaps from the upper portions of the alar cartilages These are turned 90 degrees and sutured over the dorsum A mattress stay suture is passed through the reflected alar cartilage tips and brought out at the glabella through the skin It is removed in 5 days

Greater deformities of the septum and bone require more rigid support The author uses autogenous iliac bone for good long range results despite the disability caused by re- moving the bone Dorsal support may be attained by a sin gle straight strut or by this strut combined with a columel lar support attached to the anterior nasal spine This type

of bone graft is useful in dish face deformities when supplemented with cancellous bone chips inserted in the lateral nasal, infraorbital or anterior nasal spine regions Preparation for dorsal bone grafts may be made through an incision in one nostril or through a mid-columella incision Although the latter is more convenient it leaves a residual scar Good bone coaption and a flat surface are required A notch for reception of the bone graft is made in the fronto-nasal process by chisel or bur Additional stability of the graft is obtained by passing no 28-gauge stainless steel wire through drill holes in the recipient bone and subcutaneously over the graft

Application of Plastic Surgery Principles in Early Management of Severe Facial Injuries Thomas John Zaydon and James Barrett Brown[8] (Washington Univ) describe methods used currently in handling fractures and traumatized soft tissue in severe facial injuries Proper early therapy is of vital importance in that a better final result is often achieved with a single operation A delay of a few days will result in swelling hemorrhage and fibrosis making proper reduction and fixation more difficult Success of later secondary procedures is frequently compromised by infection fibrosis bone fixation in malpositoin and distortion of soft tissues and features

Before any operative procedure is done general examination of the patient is carried out including neurologic and roentgen evaluation Shock cerebral injury cervical spine damage and ocular trauma may warrant delay in treating the face Vision and 7th nerve function are carefully checked. A thorough search for facial fractures is made by palpation Dental occlusion and patency of the nasal passages are checked Roentgenograms of the mandible orbital rims, zygoma maxillary antrum zygomatic arches and nasal bones are ordered as indicated

Reduction and stabilization of fractures receive operative priority Restoration of normal contour anatomy is the foundation for soft tissue repair Conservatism is the rule when dealing with loose bone chips

Stabilization of various facial fractures is achieved by any one or a combination of the following methods inter

(8) J Flor la M A 43 668-674 January 1957

dental wiring internal pin fixation direct wiring and packing of the maxillary antrum In stabilizing a mandibular fracture the pin is inserted below the tooth roots and inferior alveolar nerve In general the zygoma orbital borders and antrum are considered as a unit One should strive for proper bony support to protect and maintain the position of the eyes The simplest method of reducing zygomatic fractures is by direct hook elevation If the zygoma is unstable the antrum is entered molded in place and packed to maintain the orbital floor in proper position Early reduction of the maxilla is imperative as the lacrimal duct is often displaced or torn A rubber-covered Kelly forceps and a long nasal speculum are valuable for reducing fractures and dislocations of the nose and nasal septum An unstable nasal bridge may be held up with wire sutures through the nose and septum fastened over thin lead splints on either side of the nose. At times a wire may be passed into the mouth and fastened to an opposite bicuspid to aid alinement Correct fixation of the nose helps restore proper position of displaced canthi Early reduction of nasal injuries in infants may prevent some later deformities

Soft tissue wounds are gently cleansed with a mild soap or detergent and copiously irrigated with saline All ground in dirt is meticulously scrubbed out or excised Grease and oil are removed with ether or benzine A search for glass particles is made Hemostasis is vitally important as a hematoma may compromise an otherwise excellent result Eyebrows should never be shaved as they serve as landmarks and removal may predispose to conjunctivitis Local anesthesia and deep blocks of the maxillary and mandibular division of the trigeminal nerve are advocated With general anesthesia an endotracheal tube is advised. Debridement of facial tissues is kept to a minimum to prevent distortion of facial features Open packing of facial wounds is to be avoided A 7th facial nerve injury is repaired immediately Subcutaneous sutures should be used to take up any tension on the wound Skin sutures are used only for approximation In suturing facial wounds it is best to begin at a known landmark such as the border of the lip tarsus eyebrow or nostril V and Y lacerations should be approximated as such and never reversed Some wounds with tissue

loss may require a free graft for complete closure. Only rarely can a totally detached piece of tissue or feature be used successfully but undue criticism may be avoided by attempting such usage

Special care must be given to overcome the serious psychic reaction which often follows a facial injury or the most satisfactory repair will be compromised Anxiety as to permanent disfigurement is a natural reaction and honest, guarded advice as to what can be done will do much to relieve the distress of the patient and family

► [Many facial fractures are not applicable to the classification of fracture of the zygoma, orbital borders and the antrum as a unit. Fractures in this area are frequently separate and can best be cared for by direct fixation by wiring Many fractures of the malar region which will not lend themselves to reduction by "hook elevation" can be reduced by the Gillies technic.—Ed.]

Ocular Manifestations of Carotid Cavernous Sinus Fistula Following Traumatic Facial Injury are discussed by Walter W Crowe and Joseph M Kelly[9] (US Naval Hosp., Portsmouth Va) Hunter in 1757 first recognized the existence of an abnormal communication between an artery and a vein. Travers in 1809 described a unilateral pulsating exophthalmos probably the result of a carotid-cavernous sinus fistula. Baron in 1835 demonstrated a carotid-cavernous sinus fistula at autopsy According to Dandy about three fourths of all these fistulas result from trauma. Raaf and Swan estimated that this condition develops in about 1 of every 400 patients with head trauma. The anatomic location of these fistulas is shown in Figure 212

Symptoms usually appear in 21 days after injury (Naffziger) although in unusual cases the lapse of time may be 6 months Symptoms include severe headache exophthalmos buzzing or roaring in the ears projectile vomiting and nuchal rigidity from increased intracranial pressure orbital bruit and pulsation dilatation of retinal vessels with or without retinal hemorrhage venous congestion of eyelids diplopia and diminished corneal sensation The function of the first eight cranial nerves may be impaired (Sugar and Meyer) Diagnosis can usually be made from clinical signs and symptoms The history may disclose a fracture at the base of the skull or a traumatic facial injury Digital pressure of the internal carotid artery with cessation of bruit is

(9) Oral Surg Oral Med Oral Path. 9:917-927 September 1956.

diagnostic Arteriograms may be made in obscure cases

Surgery is the treatment of choice although Sugar and Meyer report 2 4% and Singleton 6-10% spontaneous cures The internal carotid artery is usually ligated in the neck under local anesthesia However due to collateral circulation it may be necessary to ligate the common carotid be-

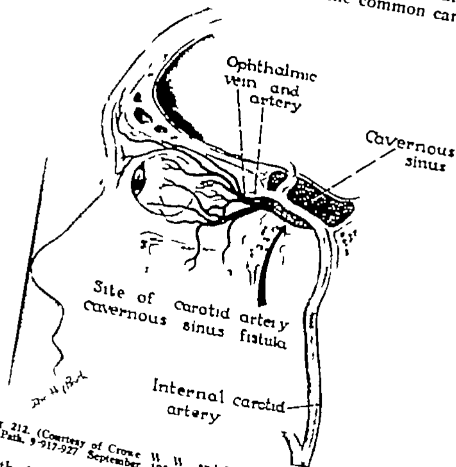


Fig 212. (Courtesy of Crowe W. W. and Kelly J M. Oral Surg Oral Med Oral Path, 9 917-927 September 1956.)

low the bifurcation to stop the bruit Dandy advocated clipping the internal carotid as it emerges from the cavernous sinus Adson clipped the internal carotid and ophthalmic artery as well Neither surgeon reported any resulting visual dysfunction Raaf and Swan have reserved clipping for patients who do not respond to carotid ligation It should be determined preoperatively if anastomatic circulation will be adequate

Visual complications of the fistula may include propto

optic atrophy, cataracts and ocular paralysis Surgery should be done before irreversible damage has occurred to the eye. Holman and associates reported that only 3 of 13 patients and Eliot 4 of 10 retained normal vision

Postoperative complications include cerebral anemia, syncope aphasia and hemiplegia Transient numbness of the hand and speech difficulty on physical exertion are common Disappearance of these episodes depends on establishment of adequate collateral circulation

The authors report a typical case in which internal carotid artery ligation necessitated the use of a Selverstone clamp for gradual arterial compression to prevent cerebral ischemic symptoms noted after the original ligation

► [Because of the urgency of diagnosing this condition at the earliest possible time if severe complications are to be avoided, and because of its association with the ever increasing incidence of severe facial injuries related to automobile accidents, this article is valuable in alerting surgeons to the possibility of its existence.—Ed.]

Repair of Nasal Defects Involving Tissue Loss. John B Erich[1] (Mayo Clinic and Found) states that most traumatic or surgical defects of the nose require skin grafting If primary closure is not possible Thiersch or Wolfe grafts may be used for superficial defects and pedicle grafts reserved for tissue that is badly scarred or changed by irradiation or to cover holes

Small areas of superficial loss may be covered by full-thickness postauricular grafts and larger areas by full thickness supraclavicular grafts These match the color of the facial skin well Large shave grafts from the arm abdomen or thigh have a poor color When the area denuded of skin on the nose is large however Erich prefers to use a split thickness abdominal or thigh graft

Immobilization is one of the most important factors in the success of nasal grafting The tie-down technic is of great value in immobilizing the graft and in preventing hematomas Full thickness grafts must be cut to size and shape for the recipient site

Small alar or columellar losses can be quickly repaired by free composite grafts from the ear as described by Brown and Cannon or from the lobe as described by Dupertuis

Simple or tubed pedicle flaps are also commonly used.

(1) Journal Lancet 77 259-272, August, 1957

The simple flaps are transferred directly from the adjacent cheek or forehead Tubed pedicle flaps are usually formed from the skin of the neck or trunk

When a pedicle flap is used to cover a perforation defect of the nose that portion of the flap covering the hole must be lined with skin to prevent later scar retraction and distortion

Flaps raised and transferred in one operation are likely to show necrosis because of inadequate blood supply If the flap is elevated in successive stages or operations designed to transfer the circulation in the flap to the pedicle the vessels in the pedicle are stimulated to become larger until they are able to nourish the entire flap Transplantation can then be done without danger of sloughing Some short flaps with wide pedicles can be elevated and transplanted in one operation The author prefers to delay 1 month before transplanting tubed flaps

No single flap is capable of correcting every defect Each flap has certain advantages and disadvantages The choice should be influenced by the most effective esthetic and functional result in the shortest possible time. The use of contiguous flaps is limited to small defects Forehead flaps are useful for repair of larger defects up to complete loss of the nose, unless the forehead skin is scarred They are also less likely to slough are less difficult to prepare and have a better color than tubed flaps Their greatest disadvantage is the conspicuous donor site which is undesirable in men Erich finds supraclavicular or chest tubed flaps preferable if disfigurement at the donor site is important to the patient Contiguous flaps are inadvisable in areas that have been exposed to radiation and should never be inlayed into the defect

Columellar loss presents a difficult plastic problem A small lined tubed flap from the upper lip or a tubed cervical flap have been used. In Erich s experience these methods are undesirable because of the resultant small caliber of the columella and the predisposition to slough A tubed clavicular flap is recommended despite the disadvantage of the large amount of tissue involved in producing the desired effect

► [This article is largely devoted to a description of various technics and evaluation of various methods for correction of a variety of nasal defects

optic atrophy cataracts and ocular paralysis Surgery should be done before irreversible damage has occurred to the eye. Holman and associates reported that only 3 of 13 patients and Eliot 4 of 10 retained normal vision

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Flaps raised and transferred in one operation are likely to show necrosis because of inadequate blood supply If the flap is elevated in successive stages or operations designed to transfer the circulation in the flap to the pedicle the vessels in the pedicle are stimulated to become larger until they are able to nourish the entire flap Transplantation can then be done without danger of sloughing Some short flaps with wide pedicles can be elevated and transplanted in one operation The author prefers to delay 1 month before transplanting tubed flaps

No single flap is capable of correcting every defect Each flap has certain advantages and disadvantages The choice should be influenced by the most effective esthetic and functional result in the shortest possible time The use of contiguous flaps is limited to small defects Forehead flaps are useful for repair of larger defects up to complete loss of the nose unless the forehead skin is scarred They are also less likely to slough are less difficult to prepare and have a better color than tubed flaps Their greatest disadvantage is the conspicuous donor site which is undesirable in men Erich finds supraclavicular or chest tubed flaps preferable if disfigurement at the donor site is important to the patient Contiguous flaps are inadvisable in areas that have been exposed to radiation and should never be inlayed into the defect.

Columellar loss presents a difficult plastic problem A small lined tubed flap from the upper lip or a tubed cervical flap have been used In Erich's experience these methods are undesirable because of the resultant small caliber of the columella and the predisposition to slough A tubed clavicular flap is recommended despite the disadvantage of the large amount of tissue involved in producing the desired effect.

► [This article is largely devoted to a description of various technics and evaluation of various methods for correction of a variety of nasal

which involve tissue loss. It is an excellent summary of procedures available for repair of such defects.—Ed.]

Reconstruction of Entire Anterior Abdominal Wall in Presence of Postradiation Changes A technic of repairing a large full thickness loss of the abdominal wall is presented by James E Pridgen and Charles W Tennison[2] (San Antonio Tex)

Woman 58, was seen 6 years after extensive x ray therapy for a uterine fibroma, with a draining 5 × 6 in abdominal ulcer present for 5 years The surrounding actinodermatitis extended between both iliac crests and from the symphysis to the rib margin.

Skin flaps 21 in. long and 8 in. wide, were designed over both anterior thighs Five operations at monthly intervals were used to delay the flaps. At the sixth operation the skin and soft tissues were removed down to the fascia from the four corners of the abdominal wall and extended to within ½ in. of the ulcer Here the abdominal cavity was entered and a 6 × 7 in. area was resected in continuity with the uterine leiomyoma. Hysterectomy and bilateral salpingo-oophorectomy were performed A fibroma of one ovary was present in the specimen The pelvis was reperitonealized and a 6 × 8 in. piece of tantalum mesh sutured over the abdominal fascial defect with cotton.

The soft tissue over the chest wall and symphysis was undermined, but only one thigh flap was necessary to cover the mesh. Split thickness skin grafts covered the remaining fascia, and the other thigh flap was returned to its bed. The wounds healed well except for a temporary draining sinus which probably resulted from the cotton sutures

The patient died 7 months postoperatively of an adenocarcinoma of the middle lung lobe. Autopsy revealed no adhesions between the tantalum mesh and the intestines Fascia had grown into the mesh for about 1 in. around the periphery and no weakness was exhibited in the mesh.

Method of Closure of Abdominal Wall Defect in Exstrophy of Bladder is described by W H Steffensen J A Ryan and E A Sinclair[3] (Blodgett Mem'l Hosp Grand Rapids, Mich) The procedure is done in three stages the first consisting of ureteral transplantation Next two transverse flaps based laterally are outlined above the defect They are elevated for about half their distance and sutured in their original position to increase the blood supply through the base of each flap At the third stage the bladder is invaginated and closed and the flaps are again elevated advanced inferiorly and interdigitated to cover the defect.

(2) Am. J Surg. 92 54-56 July 1956.
(3) Ibid., pp 9 11

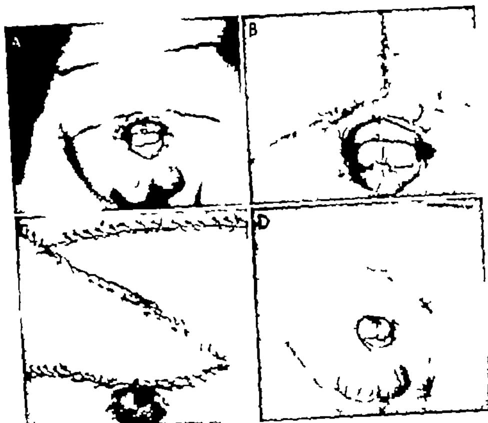


Fig 213.—*A*, outline of flaps. *B* after delay of flaps. *C* immediately after transposing flaps. *D*, 1 month after transposing flaps. (Courtesy of Steffensen W H., et al. Am. J Surg 92:9 11 July 1956)

Figure 213 illustrates this technic as used by the authors in 2 cases

► [A report of a unique and successful approach to the management of a congenital defect which must be masterfully handled.—Ed.]

Plastic Surgery of Eyelids. Kenneth Pickrell Nicholas Georgiade Carter Maguire and Hugh Crawford[4] (Durham N C.) demonstrate methods of repairing fresh lacerations of the lids General intratracheal anesthesia is preferred to local except when the patient s co-operation is needed. Transverse lacerations across the lid result in little gaping with a resultant insignificant scar Vertical severance of the tarsal plate and muscle fibers however may result in deformity from contracture caused by the lid s being pulled out of normal alinement or by notching at the free margin

Hemorrhage is easily controlled by direct pressure

(4) Am. J Surg 92:61-67 July 1956.

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(2) Am J Surg 9 54 56 July 1956.
(3) Ibid pp 9 11

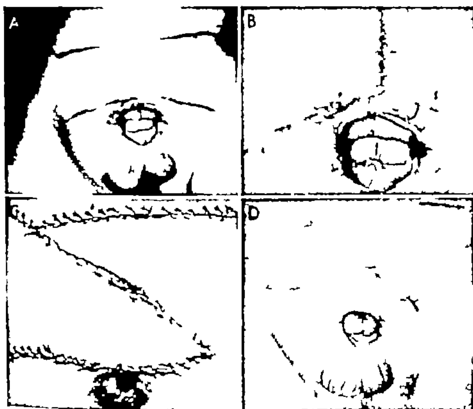


Fig 213.—A, outline of flaps. B after delay of flaps. C Immediately after transposing flaps. D, 1 month after transposing flaps. (Courtesy of Steffensen, W H., et al.: Am. J Surg. 92:9-11 July 1956.)

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Cleansing of the wound is achieved by copious saline irrigation rather than the use of antiseptics near the cornea and conjunctiva Emphysema of the lid due to traumatic continuity with the nasal cavity or to fracture of the ethmoid air cells is reduced by a small transverse puncture wound which allows the air to escape

The edges of the wound are trimmed with meticulous care debridement being held to an absolute minimum. Through and through lacerations should be repaired either by forming a flap joint or by suturing the tarsal plate on a level or location different from that of the cutaneous part of the lid Vertical lacerations require closure by a Z plasty technic to prevent notching and ectropion formation.

Direct approximation of the wound margins is possible when as much as one fourth of the total eyelid has been lost When the free lid margin is severed the first stitch is passed through the margin incorporating a good bite of the tarsus and tied so that the ciliary line and the margin on both sides of the suture fall into normal relations This suture is maintained long for traction as the remainder of the lid is sutured in layers from within outward In suturing of the tarsus the knots are tied on the skin side so as not to irritate the globe

Of the two common posttraumatic defects ectropion is often amenable to simple Z plasty If scarring is extensive, complete excision of the scar with subsequent full thickness grafting from the postauricular or clavicular area is effected. The grafts should be carefully trimmed with no adherent fat remaining Entropion can usually be managed simply by excising a transverse ellipse from the lid which turns in. Correction of inversion of the lid and eyelashes prevents scratching of the lid

For benign tumors of the lids such as hemangiomas nevi dermoids neurofibromas papillomas fibromas and xanthomas surgical excision is advocated. Irradiation with short beta rays is sometimes used in treatment of widespread hemangiomas Malignant tumors of the eyelids usually basal cell or squamous cell carcinomas are excised as soon as they are detected

► [A comprehensive evaluation of defects of the eyelids regardless of the cause. The authors point out the importance of proper evaluation of the

specific problems and the costly complications which may harass the surgeon who is not competent to cope with reconstruction or who, through lack of knowledge or indifference fails to adhere carefully to the fundamentals necessary for successful correction of these defects.—Ed.]

TISSUE TRANSPLANTATION

Neglected Free Fat Graft. Lyndon A Peer[5] (St Barnabas Rehabilitation Center Newark, N J) states that in his experience free autogenous fat grafts with the overlying dermis provide the best available material for soft tissue deficiencies in the cheek breast arms and legs The transplantation of fat, first attempted in 1893 has been neglected in recent years because of poor results in some cases probably due to a faulty technic Some investigators believe that all fat cells in free grafts fail to survive and are replaced by fibrous tissue. Evidence is presented that some adipose cells survive.

In Peer s series gently handled free fat grafts lost only about 50% of their weight and volume whereas roughly handled fat almost completely disappears Homogenous fat grafts appear not to take and are completely replaced by fibrous tissue. In selected cases a pedicle of dermal fat is preferred since it carries its own blood supply and the fat is much more likely to survive

To insure the maximum take of autogenous fat grafts the host site should be well supplied with blood vessels but the bed should be completely dry Dissection is made with sharp instruments and the graft transferred quickly to prevent drying with avoidance of all unnecessary trauma The graft is taken with a layer of dermis which is exposed by removing a thin split thickness skin graft with the dermatome. The underlying dermis and fat are then used for the graft. The wound is closed primarily if possible or covered with the previously cut split graft. Postoperatively the dressings should be firm but not too tight and the wounds immobilized for 2 weeks to prevent injuring the new developing circulation Small dermal fat grafts take better than large grafts If large grafts are to be used conditioning the

(5) Plast. & Reconstruct. Surg. 18:233-250 October 1956.

adipose tissue by interrupting the blood supply on three sides and delaying its transfer increases the percentage take Placing the patient on a fat free diet *preoperatively* assures that the intercellular fat will be unmodified by di-

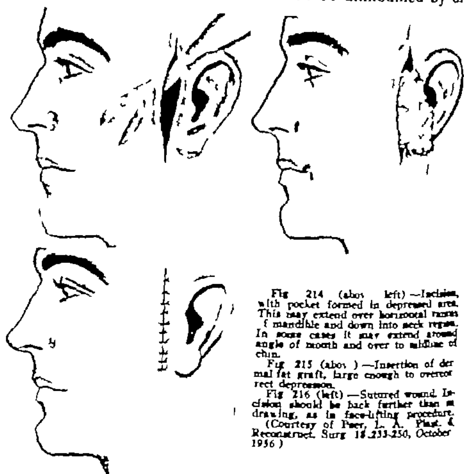


Fig 214 (above left) —Incision, with pocket formed in depressed area. This may extend over horizontal ramus of mandible and down into neck region. In some cases it may extend around angle of mouth and over to midline of chin.

Fig 215 (above) —Insertion of dermal fat graft, large enough to overcorrect depression.

Fig 216 (left) —Sutured wound. Incision should be back farther than in drawing, as in face-lifting procedure.

(Courtesy of Peer, L. A. Plast. & Reconstruct. Surg 18:233-250, October 1956)

etary fat Routine antibiotic therapy is given and the recipient pocket is drained for 48 hours after grafting

Fat was found to be the ideal grafting material to establish contour in patients with hemiatrophy of the face underdevelopment of the face associated with absence of the external ear and lipodystrophy (Figs 214-216) Infection is an absolute contraindication to the use of this type of graft.

Complications encountered were the formation of walled off cyst filled with broken-down fat loss of the graft due to infection and rarely formation of inclusion cysts

► [This is a valuable graft, frequently overlooked by many surgeons when planning reconstruction of large cavitation defects of contour A surgeon

who familiarizes himself with its idiosyncrasies finds a valuable addition to his armamentarium.—Ed.]

Immediate Replacement of Tissue Losses from Hand or Wrist by Means of Bipedicled Cross-Arm Flaps is described by Arthur W. von Deilen (Philadelphia) and James B. Cox[6] (Knoxville, Tenn.). Use of this type of flap is indicated when tendons or other deep structures are exposed or there is an extensive loss of tissue. A bipedicled flap is designed on the opposite arm according to the position and size of the defect on the hand or wrist. The flap is elevated and the raw area beneath is covered by a split thickness skin graft. The hand is then placed under the flap, which is sewed in place. Immobilization is secured with a plaster cast. At the end of 1 week, the lower pedicle of the flap is severed and the cut end sutured into the corresponding end of the defect. At the end of 2d week, the upper pedicle is severed and sutured into place. No evidence of circulatory embarrassment has been noted with either of these procedures. Cosmetic scar revision is reserved until after complete return of function to the hand.

BURNS

Burn Scar Contractures of Axilla. S. M. Dupertuis and Ross H. Musgrave[7] (Univ. of Pittsburgh) stress the im-

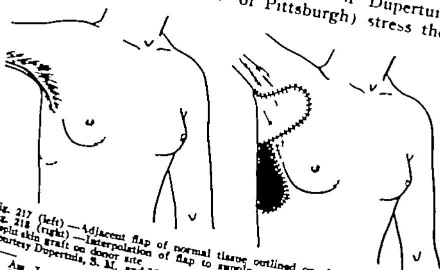


Fig. 217 (left).—Adjacent flap of normal tissue outlined on chest wall.
Fig. 218 (right).—Interpolation of flap to supply good elastic skin through axilla and split skin graft on donor site. (Courtesy Dupertuis, S. M. and Musgrave, R. H.: Am. J. Surg. 92:68-74, July 1956.)

(6) Am. J. Surg. 94:790-793, November 1957.
(7) Ibid. 92:68-74, July 1956.

portance of proper coverage of 3d-degree axillary burns to prevent contractures Three fundamental methods for correction of such contractures are Z plasty use of adjacent pedicle flaps (Figs 217 and 218) and use of free split-skin grafts The authors prefer the last method because all dense scar is excised and the possibility of malignant degeneration in a burn scar is obviated Of 50 axillary burn scar contractures 14% were corrected by Z plasty 8% by adjacent or advanced flaps and 78% by split skin grafts

Radiation Injuries Acute and Chronic, and Sequelae. A report on 79 cases of radiation injury is presented by W Brandon Macomber Mark K. H Wang John C Trabue and Reinhold Kanzler[8] (Albany Med College) The commonest cause was the promiscuous use of roentgen therapy for benign skin tumors such as hemangiomas or nevi (38%) or chronic dermatologic conditions such as acne pruritus or neurodermatitis (24%) Excessive irradiation of superfluous peristomal hair in women accounted for 14% of the cases In another 14% severe damage to the skin followed roentgen therapy for deep-seated malignant tumors. The cumulative effect of repeated short exposures to radiation on physician s hands and on the patients accounted for about 7% of the cases

The basic cell reaction to tissue irradiation is that of ionization of water into hydrogen and oxygen ions. The normal oxidation processes of the cells cease essential enzymes are inactivated the genetic apparatus seated in the cell nucleus is damaged This is manifested by coagulation of chromatin and disintegration of the cell nucleus with subsequent vacuolation and may end in necrosis Tissue cells vary in sensitivity to irradiation Usually young growing cells are more sensitive than mature cells Epithelial or endothelial cells are more sensitive than connective tissue cells Cartilage is more sensitive than bone Muscle and nerve are the most resistant tissues

In acute radiodermatitis a reduction of intercellular substances edema and vascular dilatation are seen along with the cellular changes described Clinically the condition is manifested by erythema and epilation. If the dosage is massive necrosis ensues in association with swelling erythema

(8) Plast & Reconstruct. Surg 19 9-27 January 1957

edema weeping serum and excruciating deep boring pain

Chronic radiodermatitis the commonest sequela to radiation injury chiefly affects the epithelium The latent period



Fig 219 —Chronic radiodermatitis with retardation of growth of mandible following irradiation for hemangioma at age 7 Diseased area included entire lower lip chin, mandibular region and upper neck. There was atrophy of underlying soft tissue with under-developed, slightly retarded mandible. (Courtesy of Macomber W B et al Plast. & Reconstruct. Surg. 19 9 27 January 195)

may vary from 1 to 20 years The stratum corneum is relatively resistant to irradiation whereas the stratum germinativum and the basal layer are relatively sensitive In consequence the epidermis becomes very thin and atrophic with almost complete obliteration of rete pegs Considerable distortion of normal structure may occur accompanied by






their esponsible ance or

epilation scaling and dryness of the skin Collagen is dense and hyalinized without elastic fibers Blood vessel damage occurs with endothelial proliferation and later by occlusion

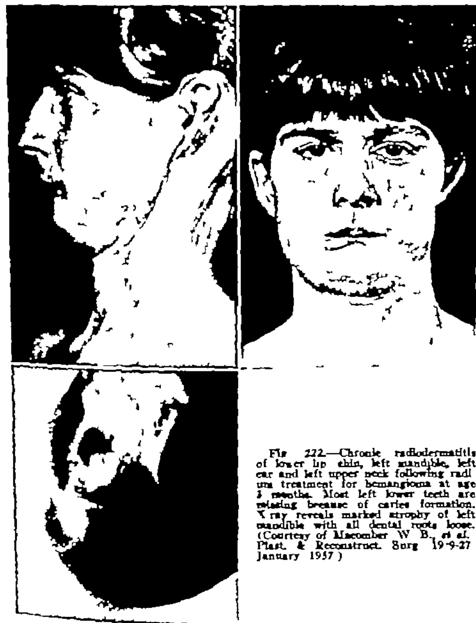


Fig 222—Chronic radiodermatitis of lower lip chin, left mandible, left ear and left upper neck following radium treatment for hemangioma at age 3 months. Most left lower teeth are missing because of caries formation. X ray reveals marked atrophy of left mandible with all dental roots loose. (Courtesy of Macomber W B, et al. Plast. & Reconstruct. Surg 19 9-27 January 1957)

or thrombosis Tissue healing is delayed and ulceration may follow minor trauma

Malignant changes had occurred in 17% of the cases in this series. The most usual change is of a squamous cell type, although basal cell epithelioma is not uncommon

Retardation of growth may follow radiation therapy (Figs 219-222) Growing cells are more radiosensitive than adult cells The cartilage cells of the epiphysis are highly sensitive to irradiation whereas hyaline cartilage and osteoblasts are relatively resistant After injury the columnar pattern of the epiphysial cartilage cells becomes disorganized and the cartilage matrix is markedly reduced. Regeneration may occur after a minimal irradiation dose, but after a heavy dose growth is slowed or may cease.

Acute radiodermatitis with necrosis ulceration pain and the threat of septicemia presents a surgical emergency Even if infection is controlled and necrotic tissue removed, the underlying granulation tissue appears gray and unhealthy and refuses free skin grafting The only method of cure is radical excision of diseased tissue and immediate coverage of the wound with a pedicle flap or free skin graft.

Chronic radiodermatitis is treated by surgical excision and free skin grafting Conservative limited excision is usually adequate when the areas involved are extensive and can be observed for suspicious changes However epitheliomas tend to be multicentric and scattered over a wide area. Radical excision is advised when an epithelioma is detected. Excision must be deep as well as wide but regional node dissection is generally not indicated When possible, the defect should be covered by a free skin graft which permits easier detection of local recurrence in the follow up examinations A local pedicle is suggested to cover bone or dense fascia joint cavities tendons or nerves or to maintain function of a mobile and contractile structure such as a lip

► [Further established data to emphasize the dangers of the indiscriminate use of x rays. Authoritative data have been established to show that radiation is not a panacea and that its use in the treatment of a wide variety of conditions is fraught with unjustified risk. It should always be administered by the most competent radiologists where indicated.—Ed.]

Surgical Management of Local Postradiation Effects Radiation therapy though it produces great benefit when properly administered in the treatment of malignancy is often followed by a series of progressive and irreversible changes terminating in radiation sclerosis postradiation necrosis or epitheliomatous neoplasia J J Longacre[9] (Cincinnati) states that most cases requiring reconstructive surgery are

(9) Am. J Surg 92 18-25 July 1956.

the result of treatment of benign lesions by several therapists without knowledge of previous dosage Also physicians dentists physicists and technicians suffer occupational overexposure

Living tissues differ in radiation reaction Tissues composed of uniform cells (bone muscle nervous system) show poor radiosensitivity Tissues of multiform cells in a continuous state of transformation are extremely radiosensitive (epidermis seminiferous tubules) The effects of irradiation of the skin vary with (1) dosage (2) radiation quality (3) size of irradiated area (4) body region and (5) individual idiosyncrasy Filters absorb soft rays hardening the beam and diminishing the caustic effect on the skin With a slow rate of irradiation regeneration will compensate for any biologic effect on somatic cells However the effect is cumulative with each treatment producing some fibrosis and vascular change

The stratum corneum is most resistant because of its inactive metabolism The stratum germinativum and basal layer are relatively sensitive and hair follicles are very sensitive. The lethal single x ray dose for tissues is 1,200 r for sebaceous glands 1 600 r for hair follicles 2 000 r for epidermis and 2,500 r for sweat glands The severe sweat gland damage parallels blood vessel damage. Approximately 3,000 r (air dose) filtered radiation at 200 kv in 20 treatments over a moderate-sized field will produce telangiectasia and the histologic appearance of chronic radiodermatitis

Acute changes begin within 48 hours There is edema of the corium, with swelling and coalescence of the collagen fibrils of the blood vessel walls and the stroma of skin appendages Some connective tissue cells are destroyed but the survivors produce new connective tissue. There are early flattening of rete pegs and shedding of the stratum corneum occasional parakeratosis edema of the prickle cells, and amitotic division in the basal layer leading to basal layer necrosis and increased pigmentary activity

If the reaction is more severe, endothelial proliferation may completely close the blood vessels The elastic tissue shreds and fibroblasts resemble foam cells Atrophy and sclerosis of the corium gradually progress along with com-

plete disappearance of vessels and skin appendages and telangiectasia ensues

Bone being vascular, holds up fairly well under irradiation Tendon nourished by a delicate vascular paratenon, occupies an intermediate position Cartilage, with a poor blood supply, is extremely susceptible Young growing cartilage and bone are quite vulnerable so that radiotherapists prefer not to use x rays in the vicinity of epiphyses of long bones It does not appear to be well recognized that the growing facial skeleton is equally vulnerable

The skin of infants is much more sensitive to irradiation than adult skin Exposed extensor surfaces are more resistant than skin of protected areas Diabetes Graves disease, vasomotor disturbances or obliterative peripheral vascular diseases predispose to an unfavorable x ray reaction. Acne rosacea psoriasis and mycosis fungoides decrease x ray tolerance.

When heavy radiation is given to control local malignancy destruction of surrounding normal tissue may be expected The damage is wider than the postradiation stigmas suggest and pain is severe Wide block excision relieves the pain but results in further sloughing of exposed tissue unless the area is immediately reconstructed with local flaps or a distant jump flap The tissue used to reconstruct the area must carry its own blood supply with it

Postradiation sclerosis comparable to radionecrosis but without ulceration is characterized by an intact shiny telangiectatic skin with dense sclerosis of subcutaneous tissues and muscle There is a latent period of 7-35 years before progressive changes may result in malignancy During this interval radical prophylactic block excision of the entire involved area will eliminate the danger Reconstruction can usually be accomplished with skin grafts or with flaps for weight bearing surfaces when the process is more severe.

Congenital Oral Deformities The role of the dental surgeon is emphasized in treatment of oral deformity especially cleft lip and palate by C Kerr McNeill (Univ of Glasgow)[1] who points out that it has been possible to bring about closure of these defects by nonsurgical methods Such methods involve application of the principle of mechanical stimulation of bone growth Gentle pressure is exerted on the hard palate except over the free edges of the defect When arch expansion or correction is carried out concurrently with growth stimulation closure is accelerated

Early application of this method in infants requiring major cleft surgery has had good results By the time surgery is undertaken usually at 15 18 months only repair of the soft palate or at most of the soft palate and of a minor defect of the hard palate remains to be done The method is also recommended in infants with arch asymmetry since the latter if left untreated can lead to disturbances of respiration deglutition mastication facial architecture and speech In cases in which there is bilateral involvement of lip and alveolar process as well as of hard and soft palates mechanical correction should be begun as early as possible Early arch alinement is desirable when there is insufficient space between the maxillary buccal segments or even to prevent a tendency toward collapse of these lateral segments during early growth

► [Attention is called to a principle which may be too frequently overlooked. Much more will be said in the future relative to potential adjustments in these cases which can result from early orthodonture.—Ed.]

Management of Patient with Cleft Lip and Cleft Palate at Children s Medical Center Boston is described by Donald W MacCollum and Sylvia Onesti Richardson[2] From 1942 to 1957 2,635 operations were performed of which 2 123 were done in the past 10 years Mortality was zero for the entire period

For over 20 years it has been customary at the Center to repair a cleft lip when the baby weighs 6 lb or over ex

(1) Brit. D J 101 191 198, Sept. 18, 1956
(2) Pediatrics 20:574-583 October 1957

hibits a steady gain in weight is in good health and is 4-6 weeks of age

METHOD.—An ether vapor anesthetic is given through an intrapharyngeal or intratracheal tube. The height of the lip is measured with calipers and markings for the pattern of repair are placed on the lip with sterile surgical ink. Incisions are made in the gingival buccal sulcus on each side of the defect and the soft tissues of the cheek are widely freed, to insure as little tension as possible on the sutures when repair is finished. The alar cartilages are undermined so that they will rotate upward and medially into a more normal position after the lip is closed. If the nasal septum is badly distorted an attempt is made to move and stabilize it in an upright position as near the midline as possible. The nasal base and muscular layers of the lip are then closed with interrupted sutures of 5-0 chromic catgut. The buccal mucosa is closed with interrupted sutures of 5-0 plain catgut, and the skin and vermilion border are closed with 5-0 nylon.

From birth the infant should be fed through a 10 ml. Asepto syringe with a 1½ in. length of soft rubber catheter attached to the end. The feeding drawn into the syringe from a sterile container is expressed through the catheter onto the surface of the tongue and is given as rapidly as the patient will accept it. The infant must be held upright to minimize ingestion of air and must be "bubbled" frequently. He is trained to sleep on the back or side never on the stomach, to prevent rubbing the face on the sheet and injuring the lip. The jacket sleeves are pinned to the diapers to accustom the infant to the restraint necessary during repair and convalescence.

After the operation a Logan bow is placed over the lip during healing to take tension off the suture line and protect the lip from injury. Use of the cleft lip feeder is resumed. The suture line is kept free from crust by cleaning with sterile sponges before and after each feeding. The nylon sutures are removed on the 3d to 5th postoperative day and the lip guard is removed on the 7th day just before discharge from the hospital.

The palatal cleft is repaired when the infant is about 14 months of age weighs 20 lb and is in satisfactory good health

METHOD.—Ether vapor anesthesia is given via an oral hook or an intratracheal tube. A narrow sliver of tissue is removed from the edges of the cleft to create a fresh raw surface. Bilateral relaxing incisions are then made these begin outside the alveolar ridge of the maxilla and extend to the level of the lateral incisors. Through these incisions the tissues of the soft and hard palate are freed. The posterior palatine vessels are identified and stretched, but not divided or ligated. The hamulus is isolated and fractured medially to lessen the lateral pull of the tensor palatine muscles. The nasal fascia is cut transversely on each side. Extensive freeing and extreme gentleness in handling the tissue are necessary. The palate is closed in layers with interrupted simple and mattress sutures of 5-0 chromic catgut.

The palate flaps must be approximated without tension and hemostasis must be complete.

The patient must never be given a nipple of any kind. The palate cleft usually decreases in width as each palatal shelf follows its normal pattern of descent from the vertical to a more horizontal plane. Bottle feeding is discouraged because it is felt that use of a nipple prevents this descent and consequently any possible decrease in the width of the cleft. Cup and spoon feeding is begun at 3-4 months.

For the first 5 postoperative days the patient is fed clear liquids at 2 hour intervals day and night this helps rinse and cleanse the palate of debris and mucus. Beginning on the 6th postoperative day milk drinks are offered. During the entire period of hospitalization and for 1 month after returning home, the patient must wear coaptation splints on the arms The patient remains in the hospital for about 10 days and the liquid diet is continued at home for another 10 days This is followed by a soft solid diet for 10 days, after which a regular diet may be resumed.

Speech development is discussed with the parents beginning before palate repair One month after operation for at least two or three 15 minute periods daily one of the parents reads to the child leafing through picture books naming the pictures cutting out the pictures correctly identified by the child and putting them in a scrap book etc To teach the child to direct the breath stream properly and to help strengthen the palatal muscles several periods are set aside for blowing activities—blowing a ping pong ball across the table trying to keep a feather aloft blowing boats back and forth in the bathtub use of horns whistles harmonicas etc As speech progresses and vocabulary is built the parents are advised to place special emphasis on words beginning with c k s ch and t When the child is age 3-4 he is seen by the speech therapist to determine whether professional help is needed If the child has normal intelligence and a good auditory discrimination and if the parents have provided a good speech environment his speech most likely will be within the limits of normal

Adequate dental care is most important for the child with a cleft palate and cleft lip To preserve the primary dentition regular visits to the dentist should begin when the child is 3 He should start to use a small toothbrush at 2 years There is frequent need for later orthodontia which is determined by the dentist orthodontist or both

Removal of tonsils and especially adenoids is not advised unless the child has a chronic upper respiratory infection or

loss of hearing. On rare occasions the tonsils may become so enlarged that they will hinder free movement of the soft palate. Children with normal nonnasal speech show remarkable activity of the lateral pharyngeal walls. Among the important muscles which create this activity are the palatopharyngei which make up the posterior faucial pillars. If tonsillectomy is advised, great care must be taken to minimize scarring of the pillars in order to preserve their mobility.

An evaluation of the long range results of the authors' patients included two groups of children totalling 164, of whom 56 represented a consecutive series operated on during 1946-47. The other 108 children were selected because of their good speech and availability for extensive examination and study. Average age at study was 8 years; average age at operation was 19 months. All were operated on by the same surgeon and all had primary one stage closures. Of the entire group 130 (79%) spoke with no nasality; of these 116 (90%) had no speech therapy other than that given by the parents. The others were helped by a speech therapist for a short while in the preschool period. Only 19% of the entire group had significant hearing loss (20 db or more in the better ear). The expected figure for children with cleft palate who have hearing loss generally is at least 25% or more, whereas the expected figure for the over-all school population is about 15%.

No significant correlation was found between the physical production of good speech or hearing loss and the type of original cleft or velar length. Facial patterns as determined by cephalometric evaluation were different from ideal normals but did not differ appreciably from the pattern of a random sample of the normal local population.

Congenital Absence of Scalp and Skull. Defects of the vertex of the head are rare but interesting congenital defects. A review of 134 collected cases of congenital absence of the scalp appeared in 1954, whereas only 22 well-documented cases of congenital defects of the scalp and skull have been found in the literature. Herbert Conway and George Johnson, Jr.[4] (New York Hosp.-Cornell Med. Center) report 2 cases of congenital absence of the scalp and 2 cases of total

(4) Ann. Surg. 144:1035-1044, December, 1956.

osteocutaneous defects of a portion of the head In 1 of these, in which the scalp and skull over the vertex were absent, a venogram revealed no opacification of the posterior portion of the superior sagittal sinus (Fig 223)

Closure by skin grafting probably is the early treatment of choice and may be lifesaving Definitive treatment may be delayed until the child is older and in good condition to

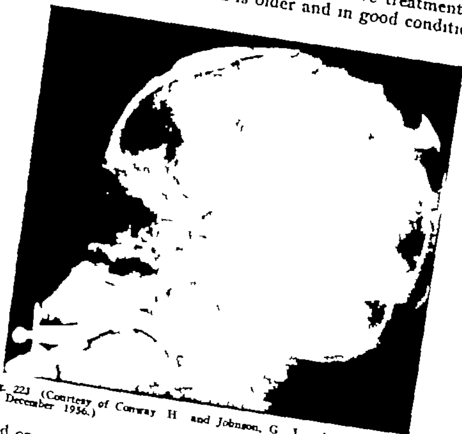


Fig. 223 (Courtesy of Conway H and Johnson, G J Ann Surg 144 1035-1044 December 1956.)

stand operation Cicatrix or skin graft over the area should be excised and the scalp and galea mobilized and sutured. Mobilization may require the use of multiple relaxation incisions in the galea parallel to the long axis of the wound A rotation graft with skin graft of the donor site, may be necessary for closure Reasonable protection for the brain is offered by a soft tissue flap but a bone graft or inert prosthesis may be added

Method of Repair for Intranasal Encephalocele Intranasal encephaloceles are a rather infrequent type of congenital cerebral exstrophy Their recognition is important as

serious sequelae can result from their removal by snare as nasal polyps The occiput is a far more common location than the sinciput.

Separation of the eyes may appear greater than it actual ly is because of flattening and widening of the nasal bridge. Repair of the skull defect after removal has generally necessitated a uni or bilateral frontal craniotomy with closure of the dehiscence with a bone graft, dural flap tantalum sheet or pericranial graft with Gelfoam® Frederick A. Figi Winchell McK. Craig and Milton E. Kurth[4] (Mayo Clinic and Found.) report on an extracranial mode of definitive surgical management.

Girl, 5 had conspicuous widening and flattening of the nasal bridge at birth X rays revealed an apparent defect in the midline suggesting an expanding lesion in the upper nares and frontoethmoid region. The neurosurgical consultant advised craniotomy which the parents refused.

The patient returned 10 years later for correction of the nasal deformity The mass bulging in the upper part of the nose was ex plored through an inverted U shaped incision extending up the nasobuccal folds and across the root of the nose. The flap was reflected and the underlying bone removed, exposing the pulsating sac of a meningocele. The floor of the right frontal sinus did not communi cate with the nasal fossa and was spread widely The thin walled sac was dissected to a 2 cm. defect in the floor of the anterior cranial fossa. The sac was ligated with chromic catgut and severed. A thick dermatome graft from the abdominal wall was wrapped over a sponge rubber mold, raw surface outward, and inserted into the cavity The skin flap was then sutured back into place.

After an uneventful postoperative course, the stent was removed under general anesthesia. The skin graft had taken completely and lar e openings were made into both nasal fossae. Patency was main tained by Penrose drains through the nostrils into the graft lined cavity Healing occurred uneventfully

Two years later the patient returned for consideration of the ex ternal nasal deformity The broadened and depressed bridge was cor rected by rasping down the lateral bony prominences and inserting an autogenous bone graft from the iliac crest.

► [The authors describe the successful management of a most difficult problem, pointing out many hazards encountered, and give an individual approach to its correction.—Ed.]

(4) Am J Surg 92 48-53 July 1956.

Malignant Degeneration in Varicose Ulcers of Lower Extremities. Malignant degeneration of varicose ulcers is rare Knox in 1925 reported findings in 59 cases from the literature Tenopyr and Silverman reported the occurrence of neoplasia in 0 4% of 1 000 chronic leg ulcers

Robert M Levine and Fun Lin Fong[5] (Jewish Gen l Hosp Montreal) report a case to re-emphasize the fact that long standing varicose ulcers may undergo malignant de-



Fig. 224—Malignant degeneration in long-standing stasis ulcer Note obvious neoplastic change in inferior one third of lesion (Courtesy of Levine, R. M., and Fong, F L. Canad. M. A. J 76-961 962 June 1 1957)

generation The patient had a 25-year history of bluish discoloration scaling and varicose ulceration on the right leg just above the external malleolus Treatment with ointments and pressure bandages had failed to heal the ulcer A biopsy revealed well-differentiated squamous cell carcinoma the seat of severe chronic inflammation (Fig 224)

Broders in 1921 reported 2 000 cases of squamous cell epithelioma in only 6 of which was the lower extremity involved. He did not specify whether or not these squamous

(5) Canad. M.A.J 76-961 962, June 1 1957

cell epitheliomas developed in an area of stasis ulceration

Malignant degeneration of a varicose ulcer is unquestionably due in part to chronic irritation and infection. If a chronic stasis ulcer does not respond to acceptable treatment malignant degeneration should be suspected and marginal and basal biopsies done If only the edges of the ulcer are malignant, wide excision and skin graft may suffice. However if the base shows evidence of malignancy, amputation combined with radical groin lymph node dissection is mandatory

Malignant Melanoma. Stanford Cade[6] presents a survey of malignant melanoma over a 27 year period at Westminster Hospital London during which time 132 patients were treated, with 122 followed to date of death Although pigmented lesions of the skin are common malignant melanoma is rare accounting for about 3% of all skin cancers The prognosis is grave but unpredictable since spontaneous regression may occur Most patients die within the first 2 years though many live to the 6th 10th years

The four types of pigmented lesions are the junctional intradermal compound and blue nevus The junctional nevus is a pigmented lesion of various shades of brown it varies in size and is smooth nearly always flat and hairless It may occur on any part of the skin but when a pigmented lesion occurs on the palms soles and genitalia it is junctional in type. Quiescent lesions may become active and recognized by characteristic histologic changes Although only a small percentage of junctional nevi develop into malignant melanoma, every melanocarcinoma of the skin or mucous membrane arises from a junctional or compound nevus The junctional nevus is common in children

The intradermal nevus is the commonest variety and includes the common mole. It varies in color and may be flat papillary or warty The hairy mole is always an intradermal nevus It never occurs on the palms soles or genitalia and does not undergo malignant changes It is rare before puberty

The compound nevus is clinically indistinguishable from the intradermal one comprising 12% of all nevi in adults and 98% of all those in children Only 10% of malignant

(6) Brit. M.J 1 119 124 Jan. 19 1957

melanomas are estimated to arise from compound nevi whereas 90% arise from junctional nevi

The blue nevus occurs most commonly on the face, dorsum of hands and feet and buttocks It may be dark brown blue or black and is nearly always hairless or smooth. It rarely undergoes malignant change (melanosarcoma)

Juvenile melanoma or prepuberal melanoma is a pigmented lesion found before puberty and is indistinguishable histologically from malignant melanoma except by experienced pathologists The lesions which usually occur on the face but may occur on the trunk vary from yellow to brown and are hairless and warty Since true malignant melanoma before puberty is rare treatment in this age group should be conservative. Postpuberal juvenile melanomas are always diagnosed as malignant and lead to unnecessary radical surgery

Malignant melanoma usually occurs on the skin but may originate in mucous membrane of the nose mouth anorectal junction or urethra Head and neck lesions have a greater 5-year survival rate than limb lesions The commonest sites are the lower limbs especially the sole and ankle. The lesion is usually a low warty macular-edged type and may be insignificant It spreads through lymphatics and blood stream and may metastasize to all tissues and organs Periodic regression may occur About one third of the patients die in the first 2 years and one sixth in the first year Only 14 of the 132 patients survived 5 years or more The rarity of malignant melanoma in puberty and increased incidence in pregnancy point to some hormonal influence Neither androgenic or estrogenic therapy nor gonadectomy or adrenalectomy has altered the course of established melanotic tumors Hypophysectomy has not yet been tried

Initial management of pigmented lesions is often poor Local excision under local anesthesia is done frequently with the appearance of small linear black satellite scars revealing recurrence Treatment of lesions showing activity requires wide excision which should include a margin of 2 cm in small lesions and 3 cm or more in lesions over 2 cm in diameter in depth the excision must include the deep fascia. This principle is followed only in very small melanomas and usually requires local skin grafting In a study of

112 patients those who had received no previous treatment of any kind had a 50% chance of control of the primary growth and those who had inadequate treatment (the majority) fared worse, 73% developing local recurrence 42% of those who received adequate treatment in the first instance remained free from recurrence in the vicinity of the primary growth

Malignant melanomas can be subdivided into those with and those without clinically enlarged lymph nodes In this series the best results were obtained in early cases from wide local incision without block dissection of regional lymph nodes An expectant policy in patients without lymph node involvement showed that 43% subsequently developed lymph nodes and that a block dissection performed for fully established lymph node metastasis failed *to control the disease in 77% of the cases Thus block dissec*tion in continuity with wide excision of the primary growth (feasible only in certain anatomic sites) is the method of choice Though it has been stated that patients with palpably involved regional lymph nodes have a 5-year survival of only 5% there is not enough evidence to justify the adoption of wide limb ablation as a routine it is justifiable only in exceptional cases as a palliative measure

► [Despite the fact that the incidence of melanosarcoma is low compared with many other forms of cancer the extremely low rate of cure establishes the importance of prophylactic surgical excision of questionable melanomas and pigmented growths subjected to trauma.—Ed.]

Carcinoma of Lip Carcinoma of the lip has been classified as the commonest intraoral malignancy Harry J Tamoney Jr [7] reports experience in 54 cases at St. Francis Hospital Hartford Conn. where a 98% cancer follow up has been maintained for 20 years Of the 54 patients (5 had lesions of the upper lip and 49 lesions of the lower lip) only 3 were women, which suggests protection against the ele*ments through the use of lipstick.* The average age was the 6th decade Medical consultation was delayed over 1 year by 8 patients A single primary excision was done in 42 patients Of the 27 patients still alive only 1 had neck metastasis when first seen Fifteen died without evidence of recurrence and 3 who had been treated by a single primary excision died of recurrence. Of the remaining 9 who

(7) Connecticut M. J 20 954-957 December 1956.

died 1 had leukemia at the time of biopsy, 3 were terminal when biopsy was done and 5 were treated with fulguration, irradiation or both

Most deaths were in patients with spread of disease to the neck Lower lip lesions usually spread first to the submaxillary nodes The presence of a single enlarged node justifies extirpation of all node-bearing areas of the neck Because of reconstructive problems excision of the primary growth in continuity with neck dissection does not seem indicated.

The causative role of pipe smoking in carcinoma of the lip appears to have been disproved Recent reports indicate the important role of exposure to weather especially actinic rays Syphilis was not a factor in the present series The absence of cases in Negroes confirmed reports in the literature and suggests a protective role of pigment

Melanoma Arising in Café au Lait Spot of Neurofibromatosis Both café au lait spots and freckles are ovoid flat macules with hyperpigmentation in cells of the basal layers resulting in varying colors but predominantly a light tan However cafe au lait spots may exhibit a varying degree of junctional change" Many authorities accept the concept of melanocarcinoma arising almost exclusively from junctional nevi or compound nevi with a junctional element Neil G Perkinson[8] (Atlanta, Ga) reports an unusual case of melanocarcinoma arising in a cafe au lait spot

Woman, 44 who had always freckled easily at age 30 noted small soft, elevated, nontender nodules of the skin. The freckles" remained unchanged except one on the right anteromedial thigh which darkened 3 years before the present examination and showed several dark raised areas after a sunburn 9 months before examination. Melanoma was reported on biopsy Wide local excision in continuity with a groin dissection was done. Pathologic diagnosis was superficial malignant melanoma and negative lymph nodes Thorough study revealed further junctional changes in the café au lait spot and an underlying neurofibroma. A few months later a random café au lait spot was excised, and microscopic examination revealed several small areas of junctional change.

Sunlight as Cause of Melanoma Clinical Survey H O Lancaster and Janet Nelson[9] (School of Pub Health and Tropical Medicine, Sydney) attempted to determine whether

(8) Am. J Surg. 93 1018-1020 June, 1957
(9) M J Australia 1 45 -456, Apr 6, 195

environmental factors particularly sunlight or certain bodily characteristics are important in causing melanoma. Special attention was given to pathologic diagnosis site of primary growth, age sex, birthplace length of life in Australia race hair, eye and skin color skin texture sensitivity of skin to sunlight areas of skin exposed occupation special industrial hazards war service and outdoor recreations Patients with melanoma were compared with patients of similar age group and sex having different forms of skin cancer and cancer of sites other than the skin Since melanoma is uncommon studies were extended to include not only Sydney but Adelaide Melbourne and Brisbane

Of 173 melanoma patients studied 160 had a positive histologic diagnosis and 2 a doubtful diagnosis There was no record of sections having been taken in 11 cases

The melanoma patients included 67 males and 106 females. The predominance of females was attributed partly to economic circumstances which made more females available for interview It also has been noted (Lancaster 1956) that more males die of melanoma in Queensland than in any other state—a factor which could also influence these figures There was a larger proportion of young persons of either sex with melanoma than with cancer of other sites Among the melanoma patients there was a predominance of those native to Australia or who had lived a long period in Australia All subjects were of European descent

Insufficient data were accumulated on blood groups

There were more red haired and fair haired persons in the melanoma group than in the other two groups Fair skinned types predominated among melanoma and other skin cancer patients Fine skin texture was more common than coarse skin in melanoma patients There was a larger proportion of blue- and green-gray-eyed persons among melanoma and skin cancer patients than among those with other cancers

About 62% of melanoma patients gave a red reaction to sun exposure rather than a brown reaction as compared with 54% of other skin cancer patients and 36% of patients with other types of cancer

The legs face and arms in that order were the chief sites of melanoma In view of the importance of skin character

istics it might be expected that the site of the melanoma would depend on the area of skin exposed This was not apparent Other types of skin cancer led melanoma with respect to duration of occupational exposure

A history of sun bathing was obtained from 29 9% of melanoma patients 17.9% of other skin cancer patients and 22 4% of patients with other cancers It was interesting that more patients with all forms of cancer had a history of mod erate sun exposure than of excessive exposure

Although sunlight has been generally accepted as the principal cause of squamous and basal cell carcinoma, this survey tends to agree with the hypothesis that this is not true of cutaneous melanoma in view of the inability to correlate exposure area to the site of the lesion

Significance of Radiophosphorus Uptake by Metastatic Head and Neck Neoplastic Cell Clifford L. Kiehn James W Blunt Jr and John D Desprez[1] (Cleveland) studied 10 patients with metastatic carcinoma of the head and neck with regard to the ability of the tumors to metabolize P^{32} The patients were given 100 μc P^{32} intravenously From 24 to 72 hours later scanning counts were taken of the lymphshed of the tumor to determine the possible localized concentration of P^{32} Scanning counts from other parts of the body and background counts were also taken these averaged 250 counts/minute (c/m) and 42 c/m respectively

All patients were operated on for carcinoma and microscopic sections were obtained for diagnosis as to differen tiation and character of the tumors The greater the meta bolic activity of the neoplastic cells the more P^{32} was taken up A fast growing cylindroma yielded 1,200 c/m Squamous cell carcinomas of the head and neck gave values of 420-750 c/m In all cases there was an increased uptake of P^{32} in the site of the tumor Necrosis about the area of neoplastic involvement reduced the count.

It is possible that this technic may eventually be used not only to determine the presence and extent of the tumor preoperatively but also to locate hidden primary tumors and to give some clue as to when it is safe to start recon struction after excisional surgery

► [The information presented is valuable in that it adds to the cumulated

(1) Plast. & Reconstruct. Surg. 19 114-120 February 1957

information relative to the behavior of malignancy treated with radioactive materials. Accumulation of this sort of data may be the means of ultimately establishing a cure for cancer.—Ed.]

Primary Chondrosarcoma of Mandible. Nicholas M. Azzato[2] (Lackland Air Force Base Hosp.) reports a case of primary chondrosarcoma of the mandible in which autopsy revealed massive extension into the neck and mediastinum with pleural and pericardial seeding. A review of the literature revealed this to be a rare entity, as records of only 3 other cases were found.

Chondrosarcoma was added to the Bone Sarcoma Registry in 1939. Geschickter and Copeland classify it into primary and secondary types. The primary type arises in normal bone, periosteum or cartilage, usually at points of muscular insertion where there is persistent cartilaginous substance. The secondary type arises from a pre-existing benign lesion, e.g., exostosis, chondroma, hereditary deforming chondrodysplasia and multiple skeletal diseases such as Paget's osteitis deformans. Lichtenstein and Jaffe divide chondrosarcoma into central and peripheral types on the basis of origin.

According to Geschickter and Copeland, primary types usually arise in a younger age group (14-21 years) than the secondary types (30-50 years). Five year survival rate in 121 cases of the primary type of all sites was 15% as compared with 44% in 118 secondary cases. Treatment is the same for both types—radical excision.

There are several possible sources of error in the diagnosis of chondrosarcoma of the mandible. It may be confused with malignant mixed tumor because of the location and similarity in microscopic appearance. X-ray studies may be misleading with respect to the degree of extension. Parotid sialograms may also be misleading.

► [Azzato calls attention to the value of correct microscopic survey and subsequent diagnosis. Establishment of proper diagnosis frequently eliminates unnecessary surgery in obviously hopeless cases.—Ed.]

Surgery for Carcinoma of Vulva. Jason H. Collins, Richard C. Burman and Neilson M. Mathews[3] report the results of exclusive surgical therapy for carcinoma of the vulva on the Tulane Service of Charity Hospital, New Orleans. An increased survival rate has been noted but problems of

(2) Plast. & Reconstruct. Surg. 19:137-142, February, 1957.
(3) Am. J. Surg. 92:37-39, July, 1956.

wound management have resulted from wide excision of the vulva and bilateral inguinal and pelvic lymphadenectomy.

The disease affects the older age group with two thirds of the patients over 50 years and one third over 65. Surgery is offered if no bony or distant metastases are noted. Vulvectomy is performed first and bilateral inguinal and pelvic lymphadenectomy done in cases in which invasive malignancy is diagnosed either on histologic examination or in studies of the vulvar specimen. In this series distant or bony metastasis was noted in 4 patients and 3 refused treatment. Surgery was performed on 43 patients. Among these 43 noninvasive lesions were found in 5 and 3 others refused gland dissection. Vulvectomy and gland dissection were performed on 35 patients with gland involvement found in 9. Bilateral involvement was present in 4 patients and 2 showed involvement of deep nodes.

Postoperative wound problems were common with only 7 of the 35 patients having primary healing. Two thirds had bilateral wound breakdown and 5 had unilateral breakdown.

Treatment of Hemangiomas. John R. Lewis, Jr.[4] (Atlanta, Ga.) finds in the literature a wide variety of ideas and considerable disagreement as to the treatment and prognosis of hemangiomas. In general, hemangiomas may be classified as cavernous or capillary. Unless the lesion can be excised easily, the bulky or cavernous hemangioma is best treated by injections of sclerosing solutions. The method of using the injection treatment determines its success. More consistently good results are obtained if treatment is not rushed to a conclusion but is hastened in a slowly cautious manner.

Not infrequently, sloughs and ulcerations with drainage have occurred. With this in mind, hyaluronidase was added to the sclerosing solution to increase its diffusion through the tumor. For 5 years the author has used a mixture of 5% sodium morrhuate with an equal volume of 2% procaine, the procaine solution containing 1 ampule of hyaluronidase (150 units)/50 cc. solution. This solution may be somewhat more dilute (1/3 sodium morrhuate and 2/3 pro-

(4) Plast. & Reconstruct. Surg. 19:201-212, March, 1957.

caine solution) when the injection is given intracutaneously When individual vessels are available half and half sodium morrhuate solution and saline or small amounts of full strength sodium morrhuate solution are used When individual vessels in lesions of the face are treated the author believes that full strength or diluted Sylnasol* solution is less irritating Whenever possible a snug pressure dressing is used for 24-48 hours after injection

Hemangiomas involving the deeper tissues of the forearm, hand foot neck tongue lips and vulva are treated as are the single isolated tumors In cases in which the hemangiomas are so bulky that replacement of the tumor by fibrous tissue still leaves a considerable tumor surgical removal of the fibrous mass must be done eventually

Excision is the treatment of choice for the port wine stain if this can be done without deforming scars

Follow up Study of Hemangiomas of Skin Treated and Untreated. Since there is still no general agreement on the management of this common lesion Walter Falk and David Levy[5] (Haifa Israel) investigated the fate of a group of vascular nevi left untreated and compared them with nevi treated by the usual radiation methods Of 116 patients seen 60 had an adequate 4-year follow up and are included in the statistical analysis presented Tabulation of results revealed that no relation between size of the nevi and indication for active therapy can be postulated.

The two common categories of hemangiomas differ markedly in regard to prognosis the flat port wine type of lesion nearly always persists whereas the raised strawberry type usually disappears spontaneously if left untreated for 5 years Some authors state that more than 90% of strawberry nevi observed by them disappear before the age of 7 In this series failure to regress was found in about 7% of the nevi observed. Although some strawberry nevi seem to grow out of proportion to the growth of the body the disproportionate growth usually ceases after the first half year and is followed by gradual involution over the next 2 or 3 years Most vascular nevi therefore fare best when left to their natural course Except for nevi which are cosmetic blemishes or those that cause functional impairment and deformity due to bleeding or unusual size or location no active

(5) A.M A J Dis. Child. 93 165 172, February 1957

therapy is undertaken For the latter types x ray or radium therapy is recommended

After the age of 7 lesions which have not regressed with or without treatment are corrected by plastic surgery Warning is given against the use of carbon dioxide snow which frequently results in ulceration and disfiguring scars

► [The two major conclusions offered in this article are mentioned only to be condemned. Granted that all or a great part of the vascular nevi might disappear at the end of 7 years, would a surgeon sit idly by and watch invasion of this area for 7 years, hoping it would regress? Tumors of this type have developed and progressed so rapidly in some very small babies as to be extremely alarming Injection of sclerosing agents commonly used offers a most satisfactory method of managing them. Irradiation of these lesions is far too hazardous for one to accept its use promiscuously Here again sclerosing agents offer a much better solution.—Ed.]

Hemangioma of Nasal Bone Report of Case is presented by James A Moore and John M Pearce[6] (New York Hosp -



Fig. 225.—Nasal bone showing characteristic sunray or sunburst pattern with trabeculations which radiate from common center and away from plane of nasal bone. (Courtesy of Moore, J. A., and Pearce, J. M. Ann. Otol., Rhin. & Laryng. 55 1012 1019 December 1956.)

(6) Ann. Otol., Rhin. & Laryng 55:1012 1019 December 1956.

Cornell Med Center) Records of only 2 other cases were found in the literature

Woman 47 had a gradually enlarging tender swelling over the right side of the nose for 2½ years. There was no history of trauma. Palpation revealed a hard 1 5 cm mass Lateral x rays showed a tumor with a typical sunburst pattern (Fig 225) The histologic appearance of excised bone was consistent with a diagnosis of hemangioma of the nasal bone.

Trauma has been cited as a possible etiologic factor in many cases of hemangioma of bone in general In only 1 of the 2 cases of nasal bone hemangioma reported in the literature was the possibility of trauma considered Attention has been called to the possible relationship of hemangioma of bone to the vascular and hormonal changes of the climacteric Although osteal hemangiomas are most frequent in the 4th and 5th decades they have been found in the newborn and in the aged It is of interest that the right side was involved in all 3 cases of nasal bone hemangioma

Hemangiomas and Their Surgical Treatment. James T Mills[7] (Dallas) points out that the plan of therapy for eradication of hemangiomas by surgery or other treatment or both should offer good functional and cosmetic results

Nevus flammeus or port wine stains may first appear as small telangiectatic areas or may involve the skin only over large areas on one or both sides of the face and forehead and downward onto the neck The lesions grow only as the child grows with no extension into the deeper tissues Strawberry nevi are small to large hemangiomas that are raised above the normal skin margins and extend slightly into the subcutaneous tissues Cavernous hemangiomas have larger vessels and extend from the skin into the subcutaneous and deeper tissues They may enlarge rapidly producing destructive masses and marked deformities

The many methods of treatment for hemangiomas have a place if used with discretion Carbon dioxide snow and fine cautery have been successful for small and telangiectatic lesions Injections of chemicals such as sodium morrhuate in small doses at intervals of a few weeks can give effective results Radium and x ray irradiation in selected cases and in proper hands has given excellent results

(7) Am. J Surg 92 75 80 July 1956.

Mills reports a case of nevus flammeus of the face treated by multiple excision (Figs 226 and 227) However it is the accepted opinion that surgery should not be performed in most of these cases Surgical removal followed by skin grafting produces as much or more of a defect than the primary lesion Covermark has been used successfully in masking these discolorations

Most strawberry type hemangiomas are best cared for by primary surgical removal The location may indicate other forms of therapy Sclerosing injections may complete-

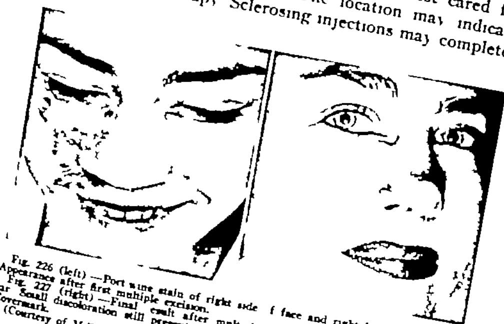


Fig. 226 (left) —Port wine stain of right side f face and right lower eyelid area. Appearance after first multiple excision.
Fig. 227 (right) —Final result after multiple excision eyelid graft from behind ear Small discoloration still present along lower eyelid area is easily masked with Covermark.
(Courtesy of Mills, J T Am. J Surg 92 75-80 July 1956.)

ly clear the lesion Radium or x ray therapy has been known to activate growth into the deeper structures

A cavernous hemangioma can involve only a small skin area or penetrate deeply and involve a large portion of the body Depending on location and extent a combination of multiple excision sclerosing injections and irradiation may be required

► [The author aptly points out many of the hazards of treating lesions arising from hemangiomas. He also points out the importance of correct appraisal of the individual tumor and the correct evaluation of the proper treatment for the individual problem at hand.—Ed.]

Hormonally Influenced Hemangioma The growth of vascular tumors in response to hormonal stimulation is a well-documented and generally accepted fact The development of nevus araneus like hemangiomas associated with the high hormonal blood levels of pregnancy has been reported The pregnancy tumor described as a fibroangioma or a form of epulis is another example of the growth of vascular elements in response to rising hormonal titers Neither telangiectasias nor pregnancy tumors are true neoplasms but they represent cyclic hyperplasia of vascular tissues The effect of endocrine stimulation on cavernous hemangiomas, true neoplasms remains controversial

Scott J Boley and William E Morse[8] (Jewish Hosp., Brooklyn) present a case of cavernous hemangioma with apparent cyclic growth associated with onset of lactation in the postpartum period

Woman 26 gravida 3 para 2, had a normal delivery Two days later she noted concomitantly painful swelling of the breasts and a painful swelling over the left thenar space. A 2×4 cm. tender bluish mass was noted but hand x rays were negative. The same tumor had occurred after her second pregnancy with disappearance at cessation of lactation but none was noted at the first gestation

A well encapsulated dark bluish red, spongy tumor was surgically removed from beneath the thenar skin. Gross and microscopic examination revealed typical characteristics of a cavernous hemangioma.

The cyclic appearance regression and reappearance of the tumor suggested response to the lactogenic hormone

► [Activation of hemangiomas during gestation has been noted for many years. In a similar manner quiescence has been noted in an activated tumor after childbirth.—Ed.]

Osteoma of Frontal Sinus Removal Combined with Immediate Repair of Frontal Bone Defect. Anthony Zovickian and Philip Cooper[9] (Boston Univ) cite statistics indicating that 50% of all tumors of the nose and paranasal sinuses are osteomas 38% of these occur in the frontal sinuses and 80% are seen before the age of 50 They are more prevalent in males and their rate of growth is unpredictable Microscopically osteomas are classified as eburnated or compact, cancellous or (the most common type) mixed They are believed to develop as the result of metaplasia of connective

(8) A.M A Arch Surg 74 482-484, March, 1957
(9) Plast. & Reconstruct Surg 19 150-155 February 1957

tissue with formation of bone by the paranasal mucosa acting as periosteum

Surgical removal is indicated for progressive expansion Tumors eroding the posterior wall of the frontal sinus or the roof of the sphenoethmoid labyrinth are the most dangerous Pneumocephalus meningitis pyoceles and secondary purulent sinusitis have been observed as manifestations of osteoma of a frontal sinus

Small osteomas have been removed by an external approach through the floor of the frontal sinus Larger tumors require removal of the anterior sinus wall for exposure In some cases a postoperative defect has been avoided by using the outer table of the frontal sinus as an osteoplastic flap in a manner similar in principle to the transfrontal craniotomy technic described by Cushing When the bone is not replaced an unsightly contour deformity results necessitating a later major plastic operation for correction

Man, 26 had an osteoma involving the right frontal sinus At surgery the entire sinus wall was removed, and the osteoma, measuring 3.5×2.2×1.9 cm., was elevated from the depth of the cavity along with its attachment to the posterior sinus wall exposing about 2 sq cm. of dura. The frontonasal duct was found to be obliterated. No gross infection was present, and the sinus lining stripped away easily Immediate grafting of the entire sinus cavity was done with cancellous autogenous iliac bone. Frontal bone contour was maintained, and operative scarring was inconspicuous

Surgical Management of Pigmented Lesions The presence of pigment adds tremendous importance to any cutaneous lesion and places it in a special category The clinical diagnosis is unreliable and one of the most malignant tumors resides in this group Despite the dangers involved various agents are being used to treat pigmented lesions Malignant melanomas generally are preceded by a benign pigmented nevus and safe scalpel prophylactic removal of the primary lesion is possible In Connecticut, where reliable cancer statistics are kept malignant melanomas account for about 1% of the total reported cancer cases

In addition to melanocarcinoma other malignancies are apt to arise in pigmented skin lesions Charles E Lockhart[1] (Springfield Mo) has encountered pigmented basal cell carcinomas malignant change in the verrucous nevus Kaposi s

(1) Am. Surgeon 23:229-239 March, 1957

sarcoma and leukemia cutis which had the clinical appearance of a common intradermal nevus Excision and microscopic examination brought to light these diagnoses

Surface pigmented lesions are difficult to diagnose clinically The intradermal nevus usually is raised rounded or dome shaped with smooth contour and often contains hair Color ranges from normal to tan or brown Usually this nevus is lighter than the typical junctional nevus which is flat hairless and deeply pigmented About 12% of the raised harmless appearing intradermal nevi contain junctional foci and are called compound nevi The juvenile melanoma also is apt to be hairless and smooth but usually is larger and more elevated than the junctional nevus commonly seen in childhood The blue nevus is a smooth slightly raised hairless blue or blue gray shiny lesion often located on the face or dorsum of the extremities It rarely becomes malignant

A full blown melanocarcinoma with satellite manifestations may be recognized at a glance However it is the premalignant or early quiescent melanoma whose recognition and prompt removal may mean so much to the patient Indications for surgical excision of a pigmented lesion should be extended beyond those commonly followed In general any such lesion should be given the benefit of a diagnostic excision Pigmented lesions on the lower extremities genitalia, palms or soles hairline near the temple or subungual regions should be excised as malignancy is more common in these areas

Although the commonly found junctional nevi seen in children are uniformly benign a great many patients with malignant melanoma have noticed a pre-existing lesion as far back as they can remember even in childhood A great opportunity presents itself to remove prophylactically many potentially dangerous lesions Excision should include the darker nevi and those in the danger areas described for adults

► [The author s appraisal of this problem is sound. If his recommendations were applied more often many needlessly incurable cases would be prevented each year —Ed.]

Pigmented Mole and Malignant Melanoma. George T Pack[2] (New York) points out that as most malignant melanomas arise from pre-existing moles this cancer could be

(2) Virginia M Month. 84 111 119 March, 1957

prevented more frequently than any other malignant neoplasm by simple excision of moles considered dangerous. The histogenesis of moles and melanomas is not definitely established although at present the neuroectodermal derivation is favored.

Study of 1,225 patients with malignant melanomas revealed that 22% of the neoplasms occurred on the head and neck, 24% on the trunk, 18% on the legs and 9% on the soles. There were only 17 Negroes in the series. Most malignant melanomas occur in patients who are very blond with fair skin of delicate texture and with blue or hazel eyes. The second group in which melanoma occurs with some frequency consists of the sandy-complexioned red headed persons who freckle on exposure to sunlight. Only 11% of the American white population are of this coloration, yet more than 80% of patients with malignant melanoma have this type of skin.

All moles of suspicious or dangerous character and all large congenital nevi should be excised in childhood before the prepuberal period. Transformation of a mole to a malignant melanoma may occur without clinical evidence. Moreover it is not unusual to see patients who have had moles excised and pronounced benign by pathologists only to develop metastatic melanoma in regional lymph nodes later. One may assume that any long-standing pigmented mole that suddenly becomes ulcerated or bleeds is in the process of transformation into a malignant melanoma. Every pigmented mole that is excised should be studied microscopically.

Multiple primary melanomas occur rarely. An independent primary melanoma can be distinguished from cutaneous metastasis of a previously excised melanoma by the fact that its origin can be traced in continuity to the stratum germinativum. A metastatic focus will disrupt the epidermis.

Prepuberal melanomas of skin resemble malignant melanomas so closely that most pathologists insist on clinical information as to the patient's age and signs of approaching puberty such as breast enlargement and presence of pubic and axillary hair. As a rule melanomas of childhood do not metastasize but case reports to the contrary have appeared. All darkly pigmented nevi in children should be excised before puberty.

In general, the prognosis for malignant melanoma in young pregnant women is much worse than for the disease occurring at other times of life or in the male Placental transmission of melanoma from mother to infant is rare but does occur

Visceral metastases from melanoma are common The incidence of metastases to the heart and brain is high enough to indicate EEG and ECG studies even in the absence of symptoms Malignant melanoma has the ability to grow in whatever tissue it lodges

Anorectal melanoma accounts for 1.25% of all cancer in this region Metastases occur via the blood stream and lymphatics and proper treatment consists of abdominoperineal resection plus pelvic lymph node dissection and bilateral dissection of the inguinal and femoral lymph nodes in continuity with the anus in one operation The prognosis is worse than for any other primary location of this tumor

Malignant melanoma of the genitalia requires radical surgical extirpation Cutaneous lesions are excised and bilateral superficial groin dissection is done Lesions on the clitoris and vulva are treated this way Penile lesions require amputation and removal of the iliac and obturator nodes as well as inguinal dissection Involvement of the deeper portions of the vagina demand vaginectomy plus the aforementioned node dissections

The cure rate for subungual melanoma is relatively high as the patient will usually consent to amputation of a digit.

In cases of suspected pigmented tumor excisional biopsy is important Once the diagnosis of malignant melanoma is established wide sacrifice of surrounding skin subcutaneous fat and fascia should be done Whenever the melanoma is closely adjacent to regional lymph nodes the lesion nodes and intervening skin and fat should be excised en bloc. The adoption of this principle first advocated by Halsted for breast cancer has perceptibly improved end results

Amputation of the extremity is indicated when a malignant melanoma on the sole has metastasized to inguinal or femoral nodes or a lesion of the nail matrix has metastasized to the axillary nodes Local recurrence at a site between the primary and demonstrated node involvement is too common to permit less radical attempts at cure The preferred type

of operation for the upper extremity is interscapulothoracic amputation For the lower extremity disarticulation at the hip with dissection of the deep lymph nodes in the groin is advocated

Radical procedures are stressed as the only feasible means at present of increasing the cure rates

► [An excellent resumé on the management of the pigmented mole by an authoritative author —Ed.]

Multiple Keloids Keloids not only develop more frequently in the Negro than in the white person but they also tend to recur more often after therapy G P Lingenfelter[3] (Denver) reports a case which illustrates the complication which may follow any cutaneous wound



Fig. 228 (left) —Recurrent keloid which gradually increased in size.
Fig. 229 (right) —One year after treatment.
(Courtesy of Lingenfelter G P Rocky Mountain M. J 54 333-335 April, 1957)

Negro had received puncture wounds and lacerations on the neck and chest about 5 years previously Keloids formed which were subsequently removed surgically The wounds were directly closed and irradiation given, but the keloids recurred. The largest growth (Fig 228) was excised the edges of the wound were allowed to retract and

(3) Rocky Mountain M. J 54.333-335 April, 1957

an intermediate split thickness skin graft from the thigh was applied. After 3 weeks the edges of the graft were irradiated No recurrence was noted in a year and slight hypertrophy of the scar at the junction of the graft and edges of the wound had not increased (Fig 229)

Suturing a wound under tension is contraindicated as it retards healing and is apt to lead to keloid formation Until more research is done excision with skin grafting of the larger defects and irradiation give the best results

► [Irradiation as a factor in preventing redevelopment of excised keloids is still controversial —Ed.]

Block V Excision for Facial Problems Gerald Brown O Connor Mar W McGregor and Sherman Saffier[4] (St Francis Mem l Hosp, San Francisco) advocate the block V incision in dealing with tumors of the lip ear or eyelid borders Advantages over a straight V excision are less chance of cutting through the tumor base excision of the immediate lymphatics and added length of the suture line closure thus preventing dimpling or retraction of the suture line The incision is made with parallel lines with a properly placed V at the base of the incision

When this type of excision is used for lip tumors one half to three fourths of the lip can be removed and primary closure can be accomplished without additional external scars Adjacent tissues are widely undermined and the mucosa is incised from the maxilla or mandible and advanced. The skin muscle and mucosa are closed in layers to obtain accurate approximation and a linear scar When a large section of the lip is excised a tight mouth may result. A few months of digital dilatation will return the mouth to normal size much as the enormous lips of the Ubangi tribe are developed

Unusual Nasal Tumors in Children are described by John F Crosby[5] (Mobile Ala) with 2 case reports The first is that of a glioma Congenital tumors of the external or internal nose containing glial tissue seem to have either the properties of a malformation only or the nature of a benign neoplasm with limited capacity for growth The existence of an encephalocele or a teratoma (dermoid) is the common explanation for the presence of ectopic glial tissue Gross and histologic features of encephalocele and glioma may be

(4) Plast & Reconstruct S rg 19 5 8, January 1957
(5) Ibid pp. 143-49 February 1957

similar but the former shows some connection to the subarachnoid space Clinically the encephalocele may pulsate or increase in size on straining whereas a nasal glioma will not Most nasal gliomas reported have been external Those reported as internal have shown all gradations of continuity with the anterior cranial fossa

CASE 1—Male infant aged 3 months had a 2 cm. dorsal nasal tumor present since birth, separating the nasal bones A firm pale mass filled the left nasal cavity At age 8 months the mass was excised through a dorsal vertical incision, and pathologic study showed gliomatous proliferation of fibrous astrocytes with a vascular stroma. Repeated follow ups resulted in excision of recurrent tumor 8 months later Six months after the second operation recurrence was again manifest.

Rhabdomyosarcoma is a rare skeletal muscle tumor Less than 200 cases were found in the literature most of which involved extremities or trunk with about 10% involving the tongue and only 1 case involving the face This tumor is rapidly invasive and usually terminates fatally within 2 years 60% recur locally and 30% metastasize to other organs primarily the lung

CASE 2—Girl 8 had a barely perceptible thickening of the right nasal ala. Biopsy revealed a typical juvenile rhabdomyosarcoma, composed principally of rhabdomyoblasts The pathologist predicted local invasion and blood stream metastasis Radiotherapy was not advised radical operation was considered the treatment of choice Cautery excision of the lower half of the right side of the nose and portion of the cheek and upper lip was followed by attachment of a forehead sickle flap to the defect. No evidence of local recurrence or of pulmonary metastases was found up to 15 months postoperatively

► [The report of these unusual tumors serves to alert the surgeon concerned with management of facial tumors to consider them in the establishment of an accurate diagnosis A correct diagnosis which will lead to proper treatment may preclude loss of life or unnecessary complications —Ed.]

Nasal Paraffinoma Following Rhinoplasty T Ray Broadbent[6] (Salt Lake City) presents 2 cases in which ointment nodules formed in soft tissues after rhinoplasty An ointment laden gauze pack was placed firmly in each nostril after operation The packs were removed 2 or 3 days later and replaced with new ones the second set was removed 3 or 4 days later About 4-6 weeks after operation small pea sized masses were noted along the side of the nasal bone and

(6) Northwest Med. 56:814-815 July 1957

over the root of the nasal ridge Massage and time failed to effect resolution The mobile masses slowly increased in size At operation fibrous walled cysts filled with soft greasy material were found and excised Microscopically the masses were compatible with paraffinomas with surrounding chronic inflammatory cells and giant cell formation

Gauze packing for use in the nose must be properly prepared and applied The gauze should be of fine mesh to avoid adherence to open wounds The ointment should fill the meshwork evenly but not abundantly, because an excess may be expressed into the incisional area. As the packs serve only as a mild support for upper and lower lateral cartilages and act as a mild lubricant they should be placed with care, to avoid nasal distortion and forcing ointment or gauze into the open wounds

Surgical Treatment of Massive Scalp Lesions The skin of the scalp gives rise to numerous primary malignant lesions and is frequently the site of metastases Tumors of the scalp are relatively slow to invade deeper structures but tend to spread laterally or to produce papillary or fungating masses It has been suggested that the tough fibrous galea aponeurotica represents a barrier to deep extension even when the superficial neoplasm is of several square centimeters in area. There is rapid spread laterally once involvement of the diploe between the outer and inner tables occur The dura also a tough fibrous area provides a barrier to downward growth Cerebrospinal fluid "seeding" has never been reported as a method of spread of primary scalp cancer

Improper treatment includes inadequate excision and multiple ineffectual use of cautery or radiation Excessive radiation has caused bone necrosis cerebral vessel damage, brain atrophy intracranial infection and death.

Metastases of scalp lesions do not occur with regularity despite the presence of large deeply invading primary lesions. When node involvement is present, the preauricular mastoid posterior cervical and occipital nodes are most frequently affected Therefore the concept of wide surgical excision of large primary scalp lesions is valid.

R. R. Braund and J D Pigott[7] (Univ of Tennessee) divide scalp cancers into five classifications depending on

(7) Cancer 9 1227 1232 Nov Dec., 1956.

depth of penetration (1) involvement of skin with pericranium intact (2) involvement of skin and pericranium (3) involvement of skin and outer plate of the skull (4) involvement of skin and total thickness of the skull (5) involvement of skin skull and dura

For treatment of small skin lesions with the pericranium intact a simple closure after wide excision is used Larger lesions leave a bigger operative defect requiring the shifting of scalp flaps or application of split thickness grafts When both skin and pericranium are involved bare bone must be resurfaced Small drill holes are made in the outer table 1 2 cm apart to allow blood and lymph to reach and nourish a split thickness graft applied to the defect When a tumor involves the outer table of the skull but not the inner the outer table is excised and a split thickness skin graft applied to the underlying cancellous bone Split thickness skin grafts may be applied directly to the dura with no provision for bone replacement when the full thickness of the skull is removed At times sufficient scalp may be available for direct approximation over a bone prosthesis to fill the cranial defect Tubed pedicles have also been used

When skin skull and dura are involved the authors prefer to apply skin grafts directly to the pia mater rather than transpose local or distant flaps or employ nonviable coverage —Gelfoam® tantalum disks etc The patient is kept in Fowler's position postoperatively to keep cerebrospinal fluid pressure at a minimum at the grafted site The graft should not be perforated or some leakage of cerebrospinal fluid will occur The dangers of penetrating injury are obvious when skull replacement or repair is not possible External protective appliances are recommended

Prevalence Histologic Types and Significance of Palmar and Plantar Nevi A review of the literature by E J Van Scott R P Reinertson and C B McCall[8] (Nat'l Inst. of Health) indicated that removal of benign pigmented nevi from the palms and soles has been advocated in the past 5 years in the general belief that chronically traumatized nevi are prone to develop into melanoma A recent survey by Pack and co-workers showed that fewer than 1% of the general population have nevi on the palms or soles Because

(8) Cancer 10 363-367 Mar Apr., 1957

4.8% or more of primary melanomas have been found to originate on the soles an area which represents 3.5% of the total body surface the conclusion has been reached that nevi of the soles are disproportionately susceptible to malignant change and therefore should be excised as a prophylactic measure

Examination of 735 persons for nevi of the palmar and plantar surfaces only showed that 195 (26 5%) had at least one pigmented lesion on these areas The histologic type of such nevi cannot be predicted by clinical examination Data indicated that routine excision of palmar and plantar nevi is not a practical measure for prevention of melanomas However pigmented lesions on any part of the body that possess characteristics of developing melanoma should be removed

Evidence suggests that the precursor lesion of melanoma is the junction nevus at the time of its transition to an intradermal nevus

► [Despite the conclusion in this article many very competent surgeons who have a vast experience with the management of cancer (including melanosarcoma) feel strongly concerning the importance of prophylactic excision of pigmented nevi or pigmented lesions from areas of the body subjected to chronic trauma. The theory that the junction nevus is the precursor of malignant melanoma is of little value when one realizes that surgical incision with a microscopic study is necessary to establish the diagnosis of a junction nevus.—Ed.]

Surgical Treatment of Plantar Corns is discussed by Ben A Rutledge and Alvin L Green[9] Corns occurring inferior to the metatarsal heads are often a major disability Symptoms usually vary from slight discomfort to inability to bear weight A plantar corn (clavus) tends to lie directly beneath a weight bearing bony prominence It can be differentiated from a plantar wart (verruca) by removal of the superficial layers A wart is characterized by elongated dermal papillae with enlarged blood vessels is sharply demarcated by a fibrous tissue wall and is tender even on lateral pressure A corn presents a horny conical core of closely packed epidermal cells arranged in concentric layers and is painful on direct pressure

Excision of the metatarsal head along with at least one third of the shaft through a short dorsal incision is reported for corns occurring beneath the central metatarsals

(9) U S. Armed F M J 8 219 221 February 1957

A follow up of 30 service personnel up to 18 months revealed immediate relief from pain ambulation by the 5th day and return to duty in 3 weeks No scar is left on the weight bearing surface and toe function is intact

► [A logical approach to the management of a very common and troublesome condition.—Ed.]

COSMETIC

Plastic Surgical Treatment of Eyelid and Orbit. James F Dowd[1] (St Louis) divides conditions of the eyelids and orbits of interest to the plastic surgeon into three categories congenital anomalies traumatic conditions and neoplastic diseases Only conditions that have come to his attention most frequently and with which he has had personal experience are discussed

The most frequent congenital anomaly is the hemangioma For the deep variety of capillary angioma complete excision is the only method of control

For correction of ptosis fascial suspension of the lip is advocated The palpebral border of the tarsal plate is fixed indirectly to the frontalis muscle through the medium of a fascial strip

Owing to the ever increasing number of automobile accidents all varieties of injuries are encountered—contusions abrasions lacerations avulsions and fractures Laceration is perhaps the most frequent form The surgical principles that apply elsewhere in the body assume increased importance in the ocular region Extensive rupture of the cornea and globe with loss of vitreous usually requires enucleation at the time of repair Because it is rarely possible to form local or distant flaps to repair superficial avulsions of skin muscle and tarsal plate such tissue losses are best covered immediately with split thickness or full thickness grafts

Fractures of the maxilla involving the infraorbital ridge floor of the orbit and the malar bone are frequently encountered Diplopia may result when displacement of the orbital contents occur This type of fracture is readily elevated under direct vision through an incision in the buccal sulcus

(1) J Internat. Coll. Surgeons 28 69 76 July 1957

and maintained by packing the antrum with iodoform gauze.

In burns if there is danger of corneal ulceration the lids should be fixed together by bilateral tarsorrhaphy Hair bearing grafts are often used to replace eyebrows destroyed by burns

Reconstruction of floor of the orbit to overcome diplopia in cases of fracture should be performed early by accurate reduction and stabilization of bone fragments by intra antral packing Later it may be necessary to introduce foreign material into the distorted orbital floor to elevate the globe.

Contracted sockets requiring skin grafts are best treated with split thickness grafts At the time of grafting the orbit is distended with dental wax. After the wax stent is removed an acrylic mold fastened indirectly by Stader splint bars and bolts to a denture is used to maintain pressure on the graft and to overcome scar contracture. After several months a suitable prosthesis can be manufactured

Malignant lesions of the lids assume several forms One type the basal cell epithelioma involves only the skin It may be excised and the wound closed or alternatively covered with adjacent flaps Other more extensive lesions will require full thickness grafts The V type of excision is applicable to smaller lesions involving the full thickness of the lid along the palpebral border For extensive lesions involving the greater portion of the lid the Hughes conjunctival tarsal flap is the procedure of choice for repair When the epithelioma occupies the lower lid the lesion together with a generous cuff of normal tissue, is excised and checked by frozen section After clearance by the pathologist the upper lid is divided into skin and muscle, and the conjunctival tarsal flap is brought down and sutured to the stump of conjunctiva remaining below The resulting defect is covered with a full thickness skin graft. Several months later the single tarsus is divided into upper and lower lids thus permitting normal function to return

Thigh Lift. John R. Lewis Jr[2] (Atlanta Ga.) describes a one-stage procedure for excising skin and fat of the thigh to produce a smooth contour

TECHNIC.—The incision should start in the inguinal region, just below the iliac spine traverse the inguinal region, cross the medial

(2) J Internat. Coll. Surgeons 27 330-334 March, 1957

aspect of the thigh to the posteromedial aspect of the thigh high against the buttock and then go down to the posteromedial aspect of the thigh to a point just proximal to the knee. The femoral vessels are avoided in the inguinal region and the long saphenous vein may be severed or left intact as indicated. The skin is elevated by excising tissue below this incision and pulling the skin upward to close it again in the inguinal region and by excising a wide ellipse of skin and fatty tissue from the posteromedial aspect of the thigh and closing this incision at that most inconspicuous location. By excising a generous wedge of fatty tissue from beneath the ends of the incision below the anterior iliac spine and above the knee it is possible to avoid extending the incision out into more noticeable areas and to avoid puckering in these areas. The wound is closed in layers to prevent development of a depressed scar. Type A white nylon sutures are preferred in the subcutaneous tissues and the dermis. The skin is approximated with fine black silk sutures or subcuticular 4-0 monofilament nylon. A snug Ace bandage is applied over the sterile dressing from the toes to the upper thigh. The patient is allowed to be ambulatory after 24 hours' rest in bed with the feet elevated. Elastic bandages are desirable for 2 weeks with supportive dressings on all the incisions as required.

MISCELLANY

Deceleration Trauma. Charles L. Marsh and Ralph C. Moore[1] (San Francisco) discuss the role of inertia and deceleration as the contributing and direct etiologic agents, respectively, in traumatic injuries due to automobile accidents. The kinetic energy developed in a 5 000 lb. car at 30 m.p.h. is about 5 000 000 ft. lb./second. Development of this linear velocity kinetic energy in itself produces no damage. It is the sudden change of force with deceleration which causes injury. In a stopping distance of 2 ft., which is a long distance in a head-on collision at 30 m.p.h., the automobile receives an impact deceleration of 15 G units, but the passenger may receive from 150 to 180 G units or more to parts of his body when he is thrown against the car. Of prime importance in discussion of practical methods of reducing liability to trauma is the method of increasing the stopping distance. It is obvious that running off the road into a ditch or field is preferable to a head-on collision. In a head-on col

(1) Am. J. Surg. 93:623-631, April, 1957.

lision at 60 m p h 1,200 G s of force or more may be applied to the passenger s body

An investigation made by the Indiana State Police together with Cornell University Medical College Crash Center reveals that 26% of the persons studied were killed by being thrown outside of the vehicle 58% were killed by bouncing around inside the cars and 16% were killed in non survivable accidents It was concluded that 84% of the persons would not have died if adequate protective measures had been applied

The windshield is responsible for head and facial injuries and the steering wheel for injuries to the thorax and thoracic viscera with contusion of the heart being recognized more and more as a factor Back seat passengers most commonly receive fractures of the spine In general after an accident the chest should receive attention first, the abdomen second the head third and the extremities last.

An x ray examination of the chest should be made first The following can occur as a result of a direct blow with sudden deceleration traumatic concussion edema of the lungs atelectasis due to mucus plugs accumulating with limitation of motion of the diaphragm and splinting of the thorax from pain hemorrhage and edema of the lungs lacerations of the lungs with or without rib fractures hemothorax, pneumothorax and avulsion of the major bronchi and vessels Several deaths have been due to major lacerations of the great vessels with fatal hemorrhage. On occasion the heart may be torn from its moorings on the great vessels or the vena cava avulsed from the right auricle.

The liver spleen and kidneys being solid organs are vulnerable to direct trauma Some authors report an 80% incidence of injury to spleen or liver when there are associated rib fractures over these organs Clinical laboratory and x ray findings should be correlated for an accurate diagnosis of splenic rupture A depressed red blood cell count and a rising white blood cell count are significant as are a shock like appearance of the patient and a complaint of pain in the left shoulder and of some pain or tenderness in the upper abdomen with or without spasm Other abdominal injuries which may b[illegible] present are contusion or rupture of the gastrointestinal tr[illegible] hemorrhage and hematoma formation with

in the bowel wall, ileus associated with fractures of the spine and rupture of the diaphragm.

Two general types of skull conditions have been observed aside from the obvious compound comminuted fractures, i.e., diffuse edema and diffuse hemorrhage over the surface of the brain. Decompression by elevation of a bone flap is sometimes helpful. These conditions lead to cerebral anoxia due to local injury which may be compounded by anoxia due to atelectasis or other lung injury. Small hemorrhages with in the substance of the brain due to contre-coup concussions have been noted and are sometimes fatal.

The whiplash type of injury is a reversal of the deceleration type but similar changes are often seen with a sudden stopping of the vehicle from forward position. In the usual whiplash injury the victim's automobile is struck from the rear. The cervical spine is first hyperextended and then violently flexed. Injuries varying from compression and dislocation of cervical vertebrae to dorsal kyphosis or torticollis due to muscle spasm are seen. It is important in such cases that x rays be made with the patient's arms pulled well down so that the full length of the cervical spine can be demonstrated.

When different types of injuries are present simultaneously throughout the body, obvious fractures of extremities should receive attention last. Effective antishock therapy at the scene of the accident before transportation to the hospital often saves life. The use of helicopters for speedy transportation of badly injured patients has been invaluable on battlefields and should be developed in crowded metropolitan areas.

► [If more attention were given to these basic facts and the obvious conclusions followed to establish laws incorporating them, a far greater drop in mortality from road accidents resulting from automobile collisions would be seen.—Ed.]

Facial Mutilations during Terrorism in Algeria: Their Repair. F. Lagrot and J. Greco[4] cite their experiences in treating mutilations of the face incurred during the terroristic wave in Algeria. Many of the wounded, because they desired to return home as soon as possible, refused to remain for surgical repair.

Nasal defects consisted of defects of the tip and the alae

(4) Presse méd. 64: 1193-1198, June 27, 1956.

partial amputation of the nasal pyramid and total amputation of the nose Lip injuries were always associated with nasal defects Auricular defects were mostly total amputations involving also an area of adjoining skin

As soon as possible a skin graft was applied to the granulating area as a transitory dressing to be resected at the beginning of definitive reconstruction Two methods were used for rhinoplasty uni or bilateral nasogenian flaps and a single frontal flap On the basis of experience in 19 cases nasogenian flaps are recommended for lower rhinoplasty Superficial defects of the lips were closed by free grafts The nasogenian flaps based near the alae were useful in reconstructing whole thickness defects of the upper lip Reconstruction of the upper fornix was performed after an original technic The defect was first treated with a free graft After a waiting period the grafted area was dissected as a flap and turned down to build the fornix and posterior lining of the lip This was then covered with nasogenian flaps giving the proper thickness and height to the lip and a convenient staggered suture was used

► [The nasogenian flap described is a versatile flap, valuable in reconstruction of a variety of defects in the region of the cheek, the alar crus and the lip —Ed.]

Middle Third Facial Fractures The maxilla is vulnerable to trauma because of its exposed position and close relation to the base of the skull orbits orbital nerve nasal fossae and maxillary sinus Displacements of bone fragments of the maxilla are caused by force violence and gravity Force from the front in an upward direction produces displacement toward the base of the cranium and causes comminution and impaction force from either side drives the malar bone into the maxillary sinus with varying numbers of radiating fractures

Damage to the injured superficial soft parts is obvious from inspection and from the history diagnosis of fractures is more difficult and is made by palpating the facial bones. Fractures of the zygoma may press on the coronoid causing pain and limitation of motion X rays are necessary to determine the direction of the fracture line and facial bones involved Follow up x rays should be made immediately after reduction and from time to time thereafter

Shock and central nervous system injury should be

treated first After control of shock a scrutinizing diagnostic examination should be made before swelling emphysema hematoma or other conditions set in which might hamper the diagnosis

G Kenneth Lewis[5] (Univ of Illinois) employs either block or infiltration anesthesia when it does not interfere with the performance of surgery When local anesthesia is not possible endotracheal anesthesia or nitrous oxide and ether is preferred Early continued immobilization for all fractures is important Drainage may become necessary in certain fractures and should be provided if separation occurs Foreign bodies should be removed but not fragments of bone that have a chance of viability Involvement of a tooth socket leads to necrosis and separation if the dead tooth is allowed to remain

Reduction and fixation of maxillary fractures are based on the available points of fixation rather than on the level at which the fracture occurs Fractures of the alveolar process should be immobilized for 30 days with the use of buccal arch bars when the alveolus is not displaced Surgical intervention is necessary when impaction into the maxillary antrum has occurred Horizontal maxillary fractures when the fragment is displaced downward are treated by intermaxillary elastic traction holding the teeth in normal occlusion with upward pressure by use of a modified Barton bandage maintains the fragments in apposition Lateral downward and backward displacement reduction is accomplished by bringing the teeth into occlusion with intermaxillary elastic traction gravity is counteracted with a modified Barton bandage Fractures of the zygomatic bone and inferior orbital rim may be reduced by an incision in the buccal membrane above the tuberosity of the maxilla an elevator is passed up behind the malar bone and the bone elevated upward and outward A temporal approach as described by Gillies is accomplished by means of an incision in the scalp through the temporal fascia following the fascia directly below the zygomatic arch to the medial surface of the bone A long flat elevator is then used to reduce the fragments In comminuted fractures of the zygoma the maxillary sinus must be evacuated of bone splinters and

(5) Illinois M. J 3 12 20 January 1937

support provided by opening the sinus through a Cauldwell Luc incision Unilateral maxillary fractures may be reduced manually and immobilization produced by intermaxillary wiring Transverse fractures of the maxilla are often associated with extensive brain injuries In this type of fracture the bony framework below the fracture sags because of gravity In backward and upward displacement in which considerable impaction is present overhead traction attached to the maxilla may be necessary Infection diplopia impingement of the zygoma on the coronoid and flattening of the face are common complications in all these fractures Mouth hygiene is best maintained by the use of ordinary commercial tooth paste

► [In extensive fractures of the face one should not lose sight of the tremendous advantage derived by making an incision which will permit accurate visualization of the fracture site and all too frequently will point out the necessity of reduction and fixation by wiring the bones involved. A frequently overlooked fracture with displacement is found in those involving the floor of the orbit. Failure to diagnose and correct these often leads to permanent displacement of the orbit and may result in a subsequent diplopia.—Ed.]

Surgical Social and Economic Aspects of a Unit Hand Injury were studied in 240 cases by William Metcalf and William Whalen[6] (St Vincent s Hosp New York) who point out that while considerable attention has been focused on major hand injuries the minor and less spectacular injuries may constitute a more serious source of economic loss because of their greater incidence Injuries in these cases included crushing lacerations and open fractures of the phalanges avulsion of the nail with underlying rupture of the nail matrix and exposure of the bone crushing injuries with multiple flap formation exposing the bone and partial or complete amputations of distal phalanges

The initial care of the wound consisted of immersing the hand in saline with commercial antibacterial detergent added Tetanus antitoxin and a sedative analgesic were injected In 220 cases digital nerve block anesthesia sufficed General anesthesia was used only when there was undue psychic disturbance or in very young patients A tourniquet was never found necessary Throughout debridement and repair the wound was copiously irrigated with saline. Basically as much tissue as possible was salvaged. Split skin

(6) J Bone & Joint S rg 39-A 317 324 April, 1957

grafts were used to cover defects reserving pedicle grafts for conservation of thumb length Antibiotics were omitted postoperatively

Two instances of infection were reported neither causing additional tissue loss Only 90 patients were hospitalized with an average stay of 1.7 days Office visits averaged 6 before return of the patient to work average time lost from work being 27 calendar days or 20 work days

► [This article shows only too graphically the cost to industry reflected in the high morbidity rate associated with hand injuries which are classed as minor All too frequently the fact is overlooked that a complication of great severity may result from a minor injury casually treated and may be even more disabling than some resulting from more severe injuries.—Ed.]

Behavior of Autogenous Bone Chips in Perichondrial Sheath. In 1934 Bisgard noted that when autogenous bone chips were placed in the vacant perichondrial sheath in dogs they fused to form a solid rib segment even though they were in contact with cartilage at either end Lyndon A Peer and John C Walker Jr[7] (St Barnabas Rehabilitation Center Newark N J) repeated this experiment in 4 human beings

PROCEDURE.—The 5th or 6th bony and cartilaginous ribs were exposed, and the perichondrium and periosteum were separated from the rib structure. A segment of cartilaginous rib was removed, leaving at least 1 in. at the sternal and costochondral junctions A segment of the outer portion of the bony rib was removed, separated into bone chips and seeded into the vacant perichondrial sheath in contact with the cartilage at the ends

After 1 week, x rays demonstrated a faint shadow in the perichondrial sheath At 9 months there was a dense shadow which formed a distinct contrast with the clear areas of the adjacent cartilaginous ribs In 1 case a dense bony structure was found during a secondary operation at 19 months Microscopic examination of a portion disclosed a normal appearing bone structure with viable bone cells scattered through the calcified matrix. Thus osteogenesis had occurred despite the fact that the rib bone chips were in contact with cartilage and human rib perichondrium has the ability to convert separate autogenous bone chips into a solid bone structure Alternately when a complete segment of cartilage is removed from a human being with some cartilage left at the costochondral and sternal ends new

(7) Plast. & Reconstruct. Surg 19 121 123 February 1957

cartilage does not form When separate segments of cartilage are seeded in the perichondrial sheath new cartilage formation does not occur but the segments are joined by fibrous tissue When autogenous rib bone chips are transplanted in muscle or fat the matrix is absorbed and all bony elements are replaced by connective tissue Thus the perichondrial sheath appears to have a bone-forming potency not exhibited by muscle and fat

► [Information is offered which enables one to get a greater insight into the behavior of living tissue in contact with transplanted autogenous tissue. Another notable contribution by Peer and his associates —Ed.]

Inverted Nipple Contribution to Surgical Treatment. Victor Spina[8] (Univ of Sao Paulo) reports a modification of the Sellheim technic of reconstruction of the inverted nipple This technic (described in 1917) which is a combination of the Basch (1893) and Kehrer (1873) procedures has been the method of choice for functional and esthetic reasons It uses the undermined areola to cover the nipple base after myotomy of the areolomammillary bundles This has the disadvantage however of forfeiting the areolar zone thereby creating a cosmetic defect There is also a tendency to secondary retraction of the nipple The author suggests the use of a free labial skin graft to reconstruct the areola The color and texture of labial skin are suitable and the type of dressing used with the graft dispenses with postoperative transfixion and traction of the nipple

► [The problem discussed by the author is not a simple one for correction nor is it without the risk of considerable complications, even to the degree of total loss of the nipple. One is dealing with correction of an inverted nipple and areola mass, which causes indescribable cosmetic distortion. Correction may require extensive undermining with proper radial incisions through the muscle and areola, thus producing the possible hazard of nipple and areola loss. Correction of the problem should impose extreme care in association with the knowledge of lurking complications.—Ed]

Changes in Skin Flap of Constructed Vagina Due to Environment. The incidence of congenital absence of the vagina has been reported as 1 5000 (Engstadt) and 1 4000 (Bryan *et al*) However Owens found only 6 cases in 502 081 female admissions to Charity Hospital New Orleans over a 34-year period In a typical case the vulva and clitoris are normal but the introitus is bridged by solid perineal tissue with varying degrees of epithelial indentation The uterus

(8) Plast. & Reconstruct Surg. 19 63-66, January

is absent or rudimentary The wolffian elements are usually well developed

George Warren Pierce I Horace Klabunde Gerald Brown O Connor and Allen H Longo (St Francis Mem l Hosp San Francisco) report a case in which a 20-year follow up after vaginoplasty was possible

In a Negress 33 with normal vulva and complete absence of the vagina except for a small dimple at the lower fourchet, a vaginal canal was constructed with a delayed, reverse tubed pedicle composed of skin and subcutaneous fatty tissue from the inner aspect of the thigh. Twenty years later she was again seen and on clinical examination the unanimous opinion of numerous colleagues was "normal vaginal mucous membrane" The canal was rugose and moist and the pH was 5

A biopsy specimen was taken and compared with normal skin and normal vaginal mucosa Microscopic study showed thin stratum corneum simulating vaginal mucosa rather than the thicker corneum of skin complete loss of hair follicles eccrine glands sebaceous glands and pigment reduction in large elastic fibers epithelial hyperplasia and increase in number and height of dermal papillae increased submucosal vascularity and increased epithelial glycogen

► [A valuable 20-year follow up of a patient with successful construction of a vagina. A careful survey has been made to show the mutation of the transplanted tissue in its transposed site.—Ed.]

Problem of Perforator Localization in Varicose Veins Operation to Deal with Perforator Incompetence is described by Theodore B Massell E Craig Heringman and Seymour Greenstone[1] (Los Angeles) With reference to the chief cause for the recurrence of varicosis Sherman (1944) showed that the usual tourniquet tests failed to detect most of the incompetent perforating and communicating veins and that about half of the incompetent perforators had no direct connection with the main saphenous trunk Ordinary vein-stripping operations therefore leave behind incompetent smaller tributaries and new networks of varices readily develop

Certain physical findings secondary to venous stasis such as ulcers subcutaneous fibrosis induration and pigmentation invariably indicate deep as well as superficial involvement Incompetent perforators may be found clinically (1) in or proximal to areas of local stasis (2) in palpable fascial defects representing the opening through which the veins

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(9) Am J Surg 92 4-8 July 1956

(1) A.M.A. Arch. Surg 74 112-121 January 1957

pass and (3) immediately below "dead end" regions on the lateral or anterior surface of the leg of long tortuous superficial tributaries of the major saphenous trunk. Tourniquet tests with one or two tourniquets are of little help in localizing perforators. However the tourniquet does aid in distinguishing postphlebitic varicoses from primary varicoses or gross incompetence of the short saphenous vein.

For localization of incompetent perforating and communicating veins the authors use phlebography as described in 1948 with a slight modification.

METHOD.—The patient is placed supine with the lower extremity elevated 15 degrees. Soft rubber tourniquets are applied to the ankle just above the knee and to the upper thigh. Injection is made percutaneously into one of the dorsal pedis veins. The ankle tourniquet obstructs the superficial venous system allowing study of the deep venous system at ankle level. The knee and thigh tourniquets impede the flow through the deep venous system, causing reflux into the superficial system via the incompetent perforators. Hypaque* 25-30 cc. gives good opacification with minimal local or systemic reactions. As the injection is completed the table is returned to the horizontal. Anteroposterior and lateral exposures are taken of the leg. The popliteal tourniquet is removed and x rays of the thigh are taken. Most of the incompetent veins will be below the knee. By study of the anteroposterior and lateral films, ordinary saphenous tributaries can be distinguished from deep communicators. By measurement and comparison with clinical findings the incompetent vessels can be localized for surgery.

Radical varicose phlebectomy involves three basic steps.

TECHNIC.—(1) The terminal greater saphenous trunk and tributaries and lesser saphenous trunk are resected conventionally. (2) The distal greater and lesser saphenous trunks are exposed at the malleolar level, divided and avulsed by intraluminary stripping. (3) Vertical incisions are made over the incompetent communicating and perforating veins. Incisions vary from 2 to 14 cm. in length and are planned so as to give access to as many perforators as possible. Since the perforators tend to occur in clusters, 4 or 5 may be interrupted through a single incision. In the thigh and proximal two thirds of the leg the veins are approached subfascially. Deep to the fascia, the perforators are straight and without tributaries; superficial to the fascia they are often tortuous and receive tributaries which are easily overlooked. In the distal third of the leg fibrous septa contraindicate the subfascial approach but the fascial opening is large enough to facilitate gentle withdrawing and ligation of the veins from an actual subfascial level. The wounds are closed in layers. Surgical time for both extremities, if the short saphenous veins are not involved, is rarely over 2½ hours. Bilateral short saphenous stripping requires an additional 30-40 minutes.

Active ambulation is begun in 6-8 hours and the average post operative hospital stay is 2 days

Results of treatment in 210 patients with 318 varicose limbs are presented On the basis of severity determined by clinical and phlebographic examination when necessary four methods of operative approach were used ranging from radical phlebectomy to terminal saphenous resection alone The incidence of complications after radical varicose phlebectomy was 14% as compared with 7% after terminal resection of the saphenous trunk alone despite the fact that 45% of the extremities manifested stasis changes and 61 presented the severest degree of varicosities

Follow up of 18 months to 7 years of 114 patients (169 limbs) revealed unsatisfactory results in 60% of 52 limbs treated by terminal resection of the saphenous vein 71% of 7 treated by stripping without perforator dissection 5% of 79 subjected to radical phlebectomy without phlebography and 3% of 31 subjected to radical phlebectomy with phlebography

Massive Lymphangioma of Leg Edward A Kitlowski[2] (Baltimore) presents a case that is of interest because of a combination of a large lymphangioma of the foot and leg and a congenital band of the ankle

Infant, aged 7 months had a large lymphangioma of the foot with extension up the leg to the knee A band around the ankle seemed to bind the very spongy cystic part from the more firm portion of the leg There were some congenital anomalies of the fingers The cystic portion of the lymphangioma extended from the congenital band, involving the whole foot. Posteriorly the outline of the sole could be seen. The outlines of the toes could not be palpated. Half of the congenital band was released by a Z plasty A large section of the lymphangioma on the dorsal side was excised. It consisted of large cysts filled with yellowish fluid At a second operation, 6 months later the remainder of the congenital band was corrected and more tumor removed leaving the skin over it. The swelling seemed to subside under a compression bandage worn for 4 months After that period it did not return and the patient wore a shoe and sock. Further correction is planned later

Expansion of Area of Skin by Progressive Distention of Subcutaneous Balloon Use of Method for Securing Skin for Subtotal Reconstruction of Ear is described by Charles G Neumann[3] (New York Univ)

(2) Plast. & Reconstruct. Surg. 19 246-249 March, 1957
(3) Ibid. pp 124-130 February 195

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